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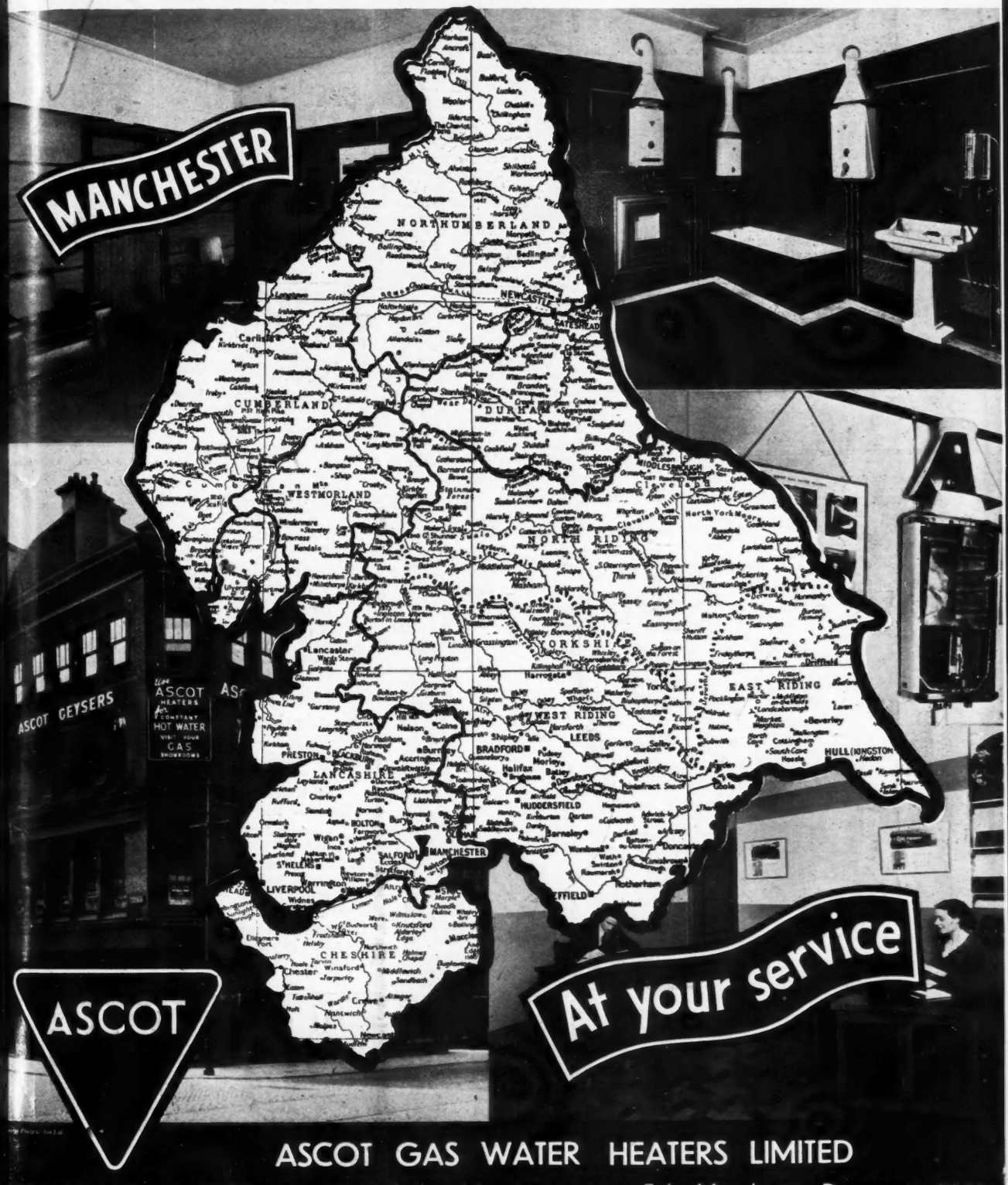

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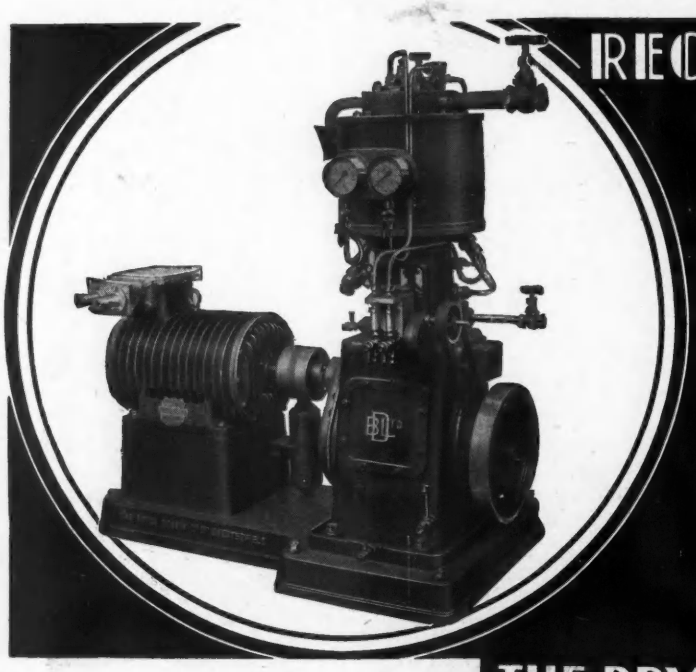

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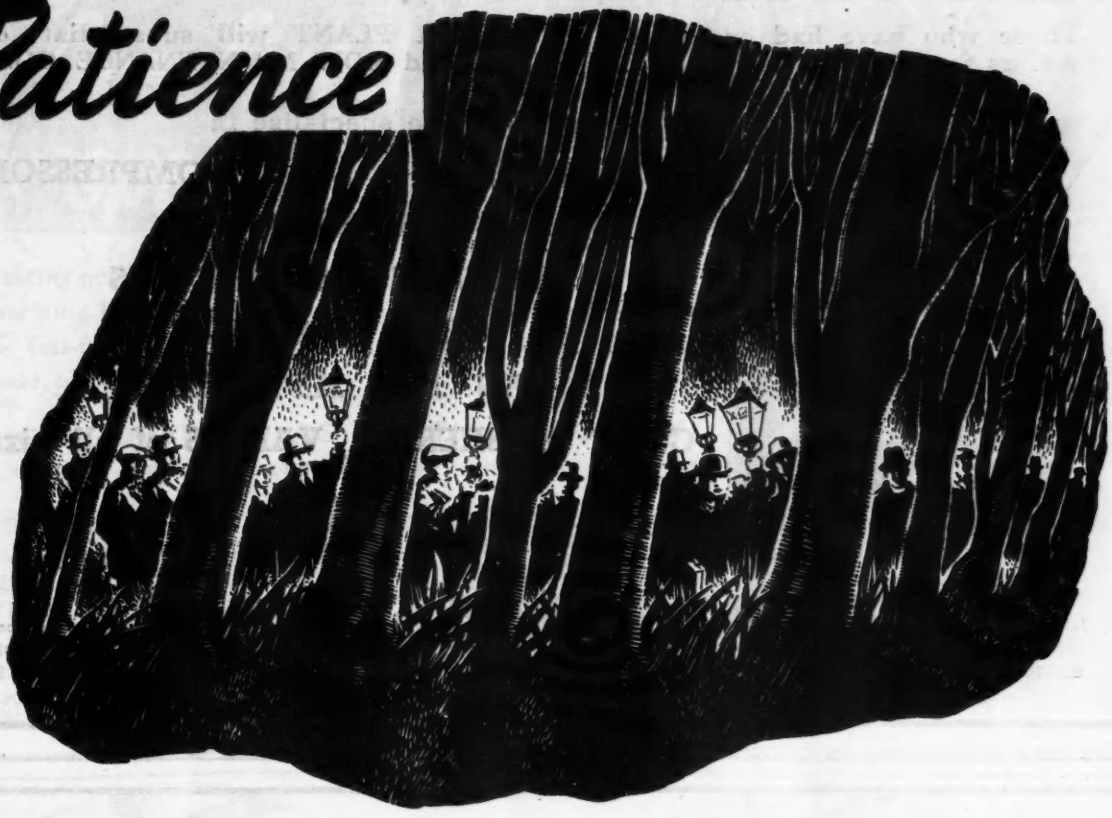

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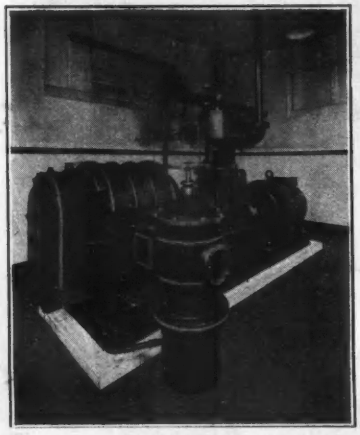

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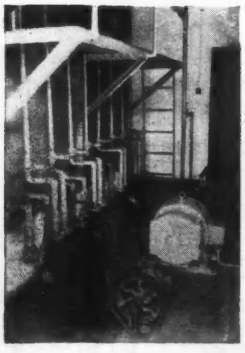

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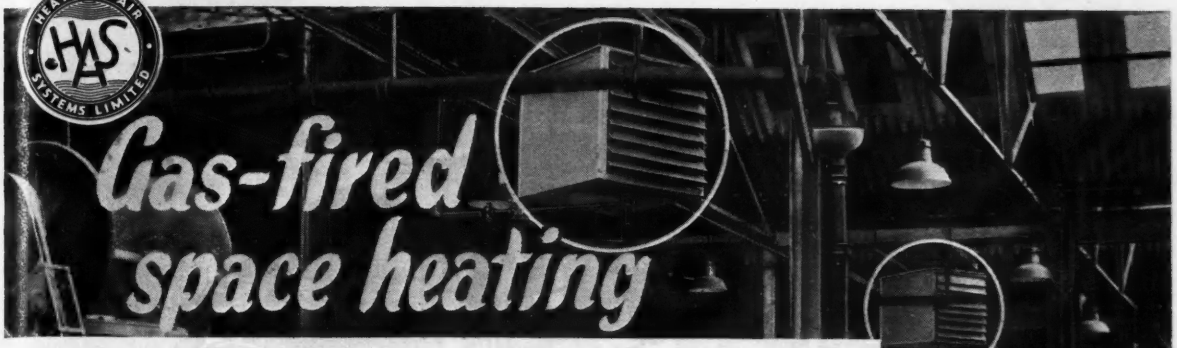

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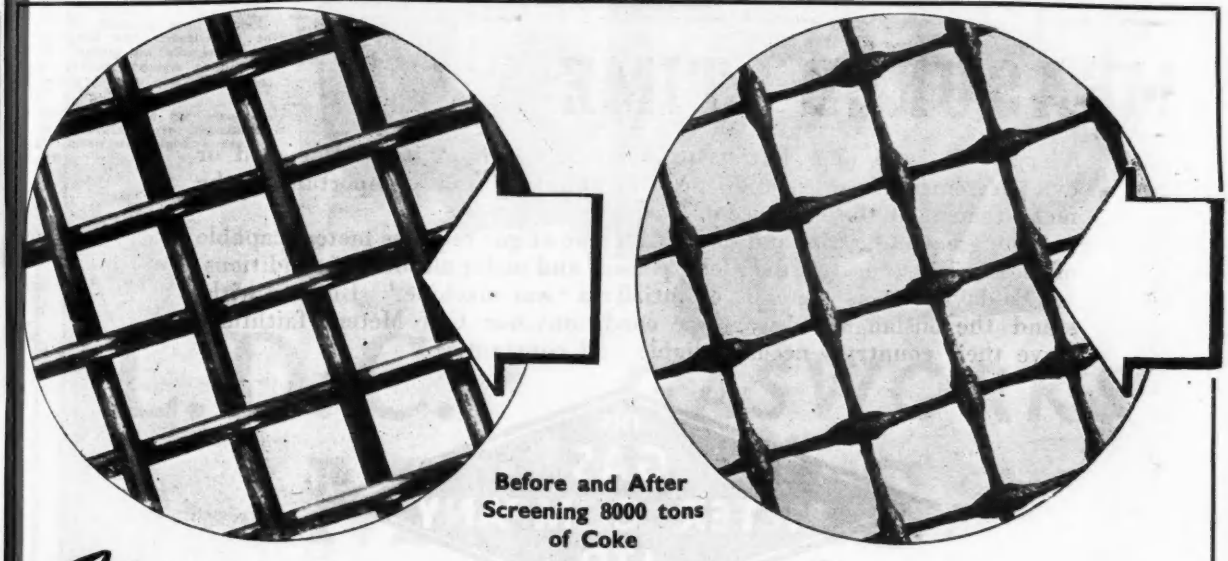

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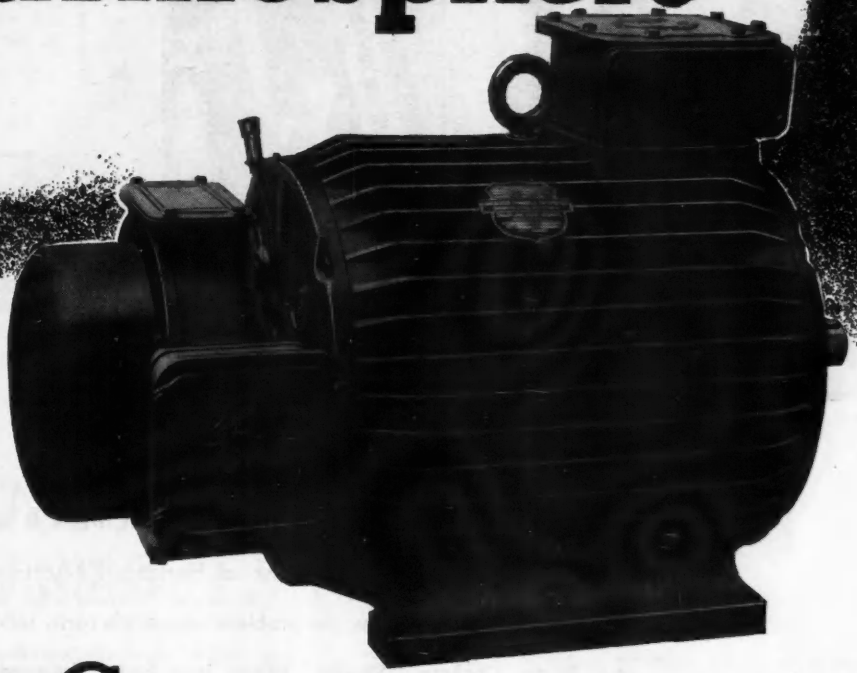

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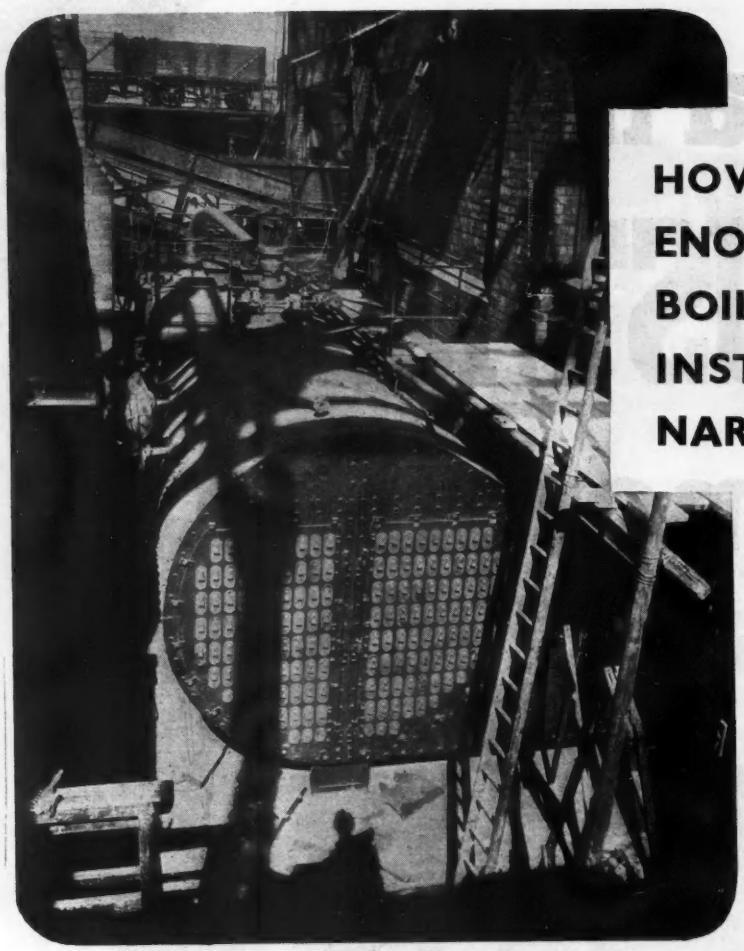

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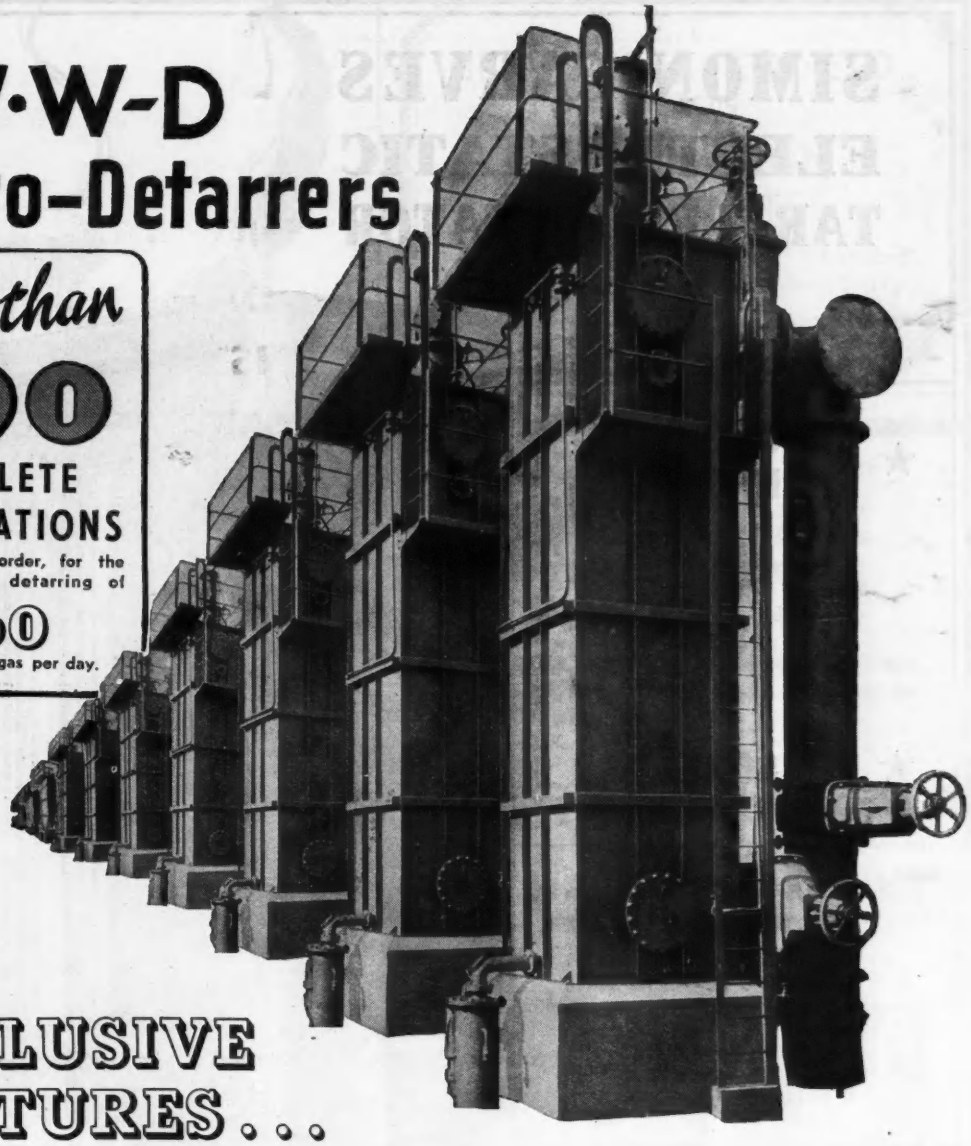

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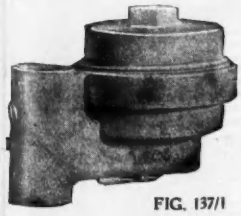

FIG. 137/1

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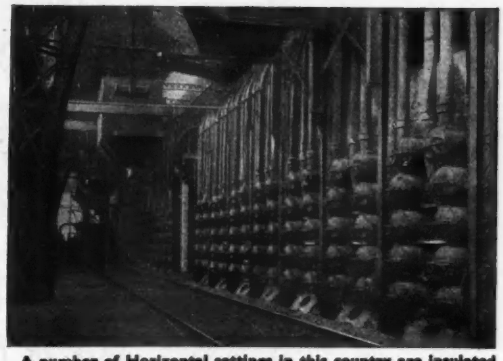

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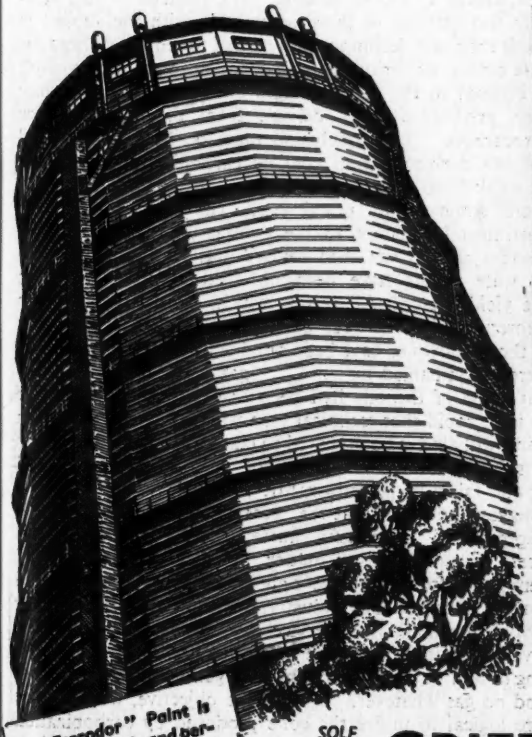

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VOL. 246 97th YEAR No. 4286

EDITORIAL NOTES

A DISGRACEFUL WASTE?

WE have long been under the belief that the carbonization of coal, as practised to-day, is a highly scientific operation and leads to the conservation of coal. But a Paper read before the Manchester and District Junior Gas Association by Mr. T. Biddulph Smith (see later pages) has caused us to rub our eyes and to wonder if we are, or have been, dreaming. Here is a practical carbonizer who has spent many years in the management of coke ovens—and has latterly been connected with the production side of the Gas Industry—declaring in good round terms that he "has long been of the opinion that carbonization as generally practised is most unscientific in its principles, and a disgraceful waste of perhaps the greatest and most valuable of our natural resources." Clearly, if the Author intends that his thesis should be taken seriously, this is an allegation which cannot be allowed to pass unheeded. Either it is right and we must mend our ways, or it is wrong and must be controverted lest others whose livelihood depends on their interest in the gas and coke oven industries might be influenced by the Author's opinion that these industries are wasters of the nation's wealth.

Mr. Biddulph Smith's view is broadly that in the technical processes of coal carbonization, as now practised, there is excessive thermal decomposition which results in the production of hydrogen and carbon from the more valuable products of distillation. There is, of course, nothing inherently new in this view. It has been formulated many times in the past by those who have endeavoured to promote a high yield of oil by the use of a high vacuum in the distillation chamber, or by purging with steam, with inert gases, or with producer gas. Mr. Biddulph Smith, however, goes further than this, and claims to have discovered (see his figure 13, p. 69) that from a normal type of coking coal there could be produced gas and condensible oils in quantities which may vary anywhere between the normal practice of 6 gallons of oil accompanied by 11,000 cu.ft. of coal gas and, at the other extreme, no gas at all and 82 gallons of condensible oils.

One of the first questions that arise is the technical possibility of achieving the high yield of oil without production of gas. The Author's paper is a curious mixture of what at the present stage of knowledge might be described as sound science with patches which to us are, to say the least, doubtful. Many of his observations and theories (insofar as they are, presumably, sound) are in agreement with the earlier work of Wheeler, Porter and Ovitz, Foxwell and others. We propose, however, not to devote ourselves to a detailed criticism of all the statements made in the Paper, but to confine ourselves to certain major implications. It will be agreed that the primary products of coal carbonization contain large quantities of oils, and consequently the volatile products evolved in the internal zone of the carbonizing mass—*i.e.*, on the cooler side of the plastic layer—contain relatively larger amounts of liquid products. It will also be agreed that the heavier of these products will condense on the core of cool coal, and will subsequently be re-evaporated and partly decomposed. *If we want liquid products*, therefore, we must find means of so conducting the carbonizing process as to prevent the condensation of the primary liquid products within the charge and their subsequent decomposition; in other words, the primary products of carbonization should be removed from the retort within a matter of seconds without being subjected to a higher temperature than that at which they were generated. The conditions for high oil yield from coal carbonization are well known; by applying these methods it has been found possible to secure yields up to some 18–22 gallons per ton of coal, accompanied by, shall we say, 25–30 therms of gas of high calorific value. Laboratory experiments in which the coal is heated under conditions which would be commercialiy impossible because of the cost and of the very low output have recorded yields of oils as high as 16% (say, 30–40 gallons per ton according to the specific gravity), but even these figures, obtained by Burgess and Wheeler in 1910, are a long way from the 80-odd gallons suggested by the Author.

This theoretical estimate of the oil yield appears to be based on the following reasoning: By withdrawing the products from the plastic layer, oils can be condensed having a carbon/hydrogen ratio of 9.6 : 1. It is then assumed that "all the hydrogen ultimately obtained, either in the free state or combined with carbon as methane, has been produced by the destruction of 10.6 times its weight of hydrocarbon oils." Since the total weight of hydrogen in these two gases from a normal coke oven is 72 lb. per ton of coal, "this, from the above calculation, has been produced by the destruction of $72 \times 10.6 = 763.2$ lb. of hydrocarbon oils." This oil, added to the 6 gallons of tar obtained, makes up the 82 gallons. The fallacies in this argument are too obvious to those acquainted with the subject of the constitution and decomposition of coal to require elaboration here. It cannot be seriously argued, for example, that volatile matter evolved in the higher ranges of temperature, in which hydrogen predominates, is derived from the decomposition of hydrocarbons. The conclusion must be that the practical yield of oils derivable from coal by carbonization of normal coals is unlikely to exceed about 25 gallons per ton under any conditions commercially practicable. The Author has given no experimental evidence to the contrary, though he hinted that a secret process has been devised and "on a small experimental scale results have been obtained which confirm the possible yields described," results which, "while not equal to the theoretical yield of over 80 gallons per ton of coal, are double those known to have been obtained by any other process, and were accompanied by . . . gas . . . demonstrating that some of the oils had been cracked." The march of science is so rapid that technical men will always keep an open mind, and will always be prepared to change their opinions when proof is given. The onus of proof in this instance should plainly and fairly be placed on Mr. Biddulph Smith.

To suggest, however, that the present methods of carbonization represent a "disgraceful waste . . . of our natural resources" is quite another matter. Is the production of oil and semi-coke from coal the only method of using coal to advantage? Does the Gas Industry, for example, exist to supply oil through the mains and services, or to supply gas? If the objective is admitted to be the supply of gas, what should we be doing to aim at the production of 82 gallons of oil per ton of coal and no gas whatever? If oil is the objective, would it not be more logical to utilize the coke produced by carbonization for the production of oil and other materials by the Fischer-Tropsch or some other related process, or to use raw coal for the production of oil by hydrogenation, in both of which processes much higher oil yields are obtained than the 82 gallons a ton here suggested? A fair value for oils or tar sold at works

would be 1½d. a therm. On this basis is it a paying proposition to produce "condensible oils" at the expense of gas? We are asking many questions which, we suggest, are pertinent. Processes have been designed and have received encouragement in the Gas Industry for cracking tar in the retorts to gas, even though a considerable amount of the tar is converted thereby into carbon which is subsequently sold as coke. From the aspect of the Gas Industry the economics of the Author's proposals appear to be fundamentally unsound.

All considerations, technical and economic, seem to us to point to the conclusion that the Author's indictment of the carbonizing industries is both unsubstantiated and unwarranted. We cannot accept as well-founded the accusation that because we do not recover the theoretically maximum quantity of oils from the coal we treat we are wasting the national resources. As an addendum, we cannot bring ourselves to agree with the Author's estimate concerning what constitutes the theoretical yield.

THE COAL INDUSTRY

NOW that the vote has been cast, the cry of the homing politician is less raucous in the land, and the wearied electorate is at rest, we may permit ourselves to ask what is really going to be done about the coal industry. It is one thing to set up a smoke screen of words, and another to take positive action which shall result in a real and lasting settlement of the problems that have arisen. In any industry, whoever manages and directs it, there are three partners each of whom must be satisfied if peace and contentment are to prevail.

One of these composite partners consists of those who provide the money. Of late years in the world in general there has been a deplorable failure to provide capital with a fair return. The price of money has dropped to a very low level, so much so that the man or woman who is thrifty in life and saves for old age, now finds it utterly impossible to live on those savings. Labour, which in general does not save, largely because of inability to do so but not entirely for that reason, seems to be quite satisfied with that position. Many are not a little disturbed by it, and begin to wonder how future businesses will be financed. Professor Richardson, of Leeds, has lately called attention to the fact that "in the past, trade unions have mainly tried to obtain better wages for their members, not by working for increased industrial efficiency, but by struggling for a bigger share of the product of industry at the expense of capital, management, and sometimes consumers." The miners have certainly succeeded in nearly wiping out the profit of coal mining during the uneasy peace between the two halves of the German War. One of their objects has now been achieved, and it cannot be more completely achieved under nationalization, since compensation must be paid to existing shareholders.

The second partner we will take as the consumer. No industry can continue to exist unless it satisfies the consumer. No industry? Well perhaps that is not true, for a monopoly that people cannot do without can continue to exist however it treats the consumer. The Post Office is in that category. So is the coal industry. The price of coal has now gone to absurd heights. Industries in which coal (or fuel of any sort) is a small proportion of the cost of production will not feel the rise very greatly, but basic industries, such as iron and steel, in which coal is a very large part of the cost are gravely handicapped. The price of coke has increased some 135%. Dr. McCance, Deputy Chairman of Colville's Ltd., has lately wondered "if those Government controls which have cheerfully added shillings to the price of coal, or those workers who have striven by strike to reduce their output during the war, have ever given a thought to what their actions meant to other industries. In the company with which I am associated we have taken pains to develop ourselves as efficient coal users, but the war increases in the price of coal have already increased our expenditure by £2,000,000 per annum. . . . If the present price of fuel continues it will mean nothing less than complete extinction for some of the works in this country when normal competitive conditions are resumed. . . . And if steel cannot be produced at an economic price owing to these burdens, what is to happen to the engineering and shipbuilding industries of the country?" The consumers of coal are not satisfied with its price, they are not satisfied with its quality, they have not that free choice that is necessary, and they are not satisfied even as to the quantities with which they are provided.

The last, but the most vocal, of the partners is labour. Labour is entitled to a fair wage for a fair day's work. The Statistical Digest published by the Ministry of Fuel and Power disclosed alarming absenteeism following substantial wage increases. But in that period their wages had been nearly doubled, and coal-mining is now 12th, as compared with 81st in 1939, in the list of industrial wage rates. The nation has done its duty by the miners. Professor Richardson has said: "Whatever may have been formerly the possibilities and justification for raising wages by diverting resources to labour from other sections of the community, the opportunities for doing this are now so small, in consequence of the changes brought about by taxation, that higher standards of living for the workers will in future depend almost entirely upon advances in industrial techniques, equipment, and organization, and in greater efficiency of labour." That must be the objective in every industry, the coal industry, the Gas Industry, and so forth. It does not matter from this angle whether the mines are nationalized or whether they remain under private ownership. Efficiency must be the objective. Mr. Foot commented on his return from his visits to the coal-fields on the good and happy relations between miners and management and directors. There is plenty of goodwill, and the miner is a thoroughly good sort at heart. What is wrong has been the leadership. He has been encouraged to follow a political will-o'-the-wisp, a parrot-cry which can do nothing for him save to bring administrative posts to those who have the good or bad fortune to obtain them.

Against this background, the Minister of Fuel and Power put his head into the lion's den at Blackpool to address the National Union of Mineworkers. He indicated much that has been done for the miners (but apparently nothing for the other partners) during the war, and said that a central authority would be set up as "an independent body appointed by the Minister with the fullest powers to compel amalgamations wherever the national interest called for them, if they were not voluntarily forthcoming, in order to ensure that the technical reorganization called for by the Reid report is effectively carried out. The central authority would be provided with teeth." Teeth? Upon whom are they be to used? Upon one partner only? Quite rightly the Minister said that "the problem of securing full co-operation between the two sides of the industry [what of the third side, the poor consumer?] is the most difficult the industry has to face." It can only be faced and solved by the common action of men of goodwill. Let all recognize that the solution of the problems which the past 30 years have bequeathed to the coal industry is essential if this country is to pull through the difficult times that lie ahead. The gas and electrical industries will do their utmost to see that coal is used efficiently; we do not doubt that the same can be said of those industries that burn raw coal in boilers and furnaces and gas producers. The coal industry must do its part; and that applies, not to one partner alone, but to all.

Mr. Lloyd George also said: "The coal industry must be operated in accordance with the national need and with the maximum efficiency, and long-term planning is essential having regard to the fact that coal is a national but at the same time a wasting asset." He pointed to coal prices as one important factor, and added that another was productivity. "If productivity," he said, "continues at its present level, the mining industry will become a drag on the economic life of the country at a time when Britain's place in the world depends on the degree and rapidity of her economic recovery from the effects of the war." Our politicians and would-be politicians have had much to say. Now let them get on with some useful work, lest it be said of them that they fiddled while England burned wastefully what coal it saw fit to produce.

Further Decline

We have been thinking about the coal industry in a very general way. Let us for a moment turn to the particular. The output of the north-western coalfields has been declining for many years. A report of a survey undertaken by the Ministry of Fuel and Power, published last week, says that the decline will continue unless resolute action is taken. In the area are the coalfields of Lancashire and Cheshire and North Wales. In 1908 the output of the Lancashire and Cheshire coalfield was 26,000,000 tons. In 1944 total saleable coal was 11,146,600 tons. It is estimated that by reason of the closing of pits the number of men employed in the mines of Lancashire and Cheshire will fall in 30 years by over 18,000 and in 40 years by over 23,000. The present number is 49,600. A period of 30 years is ample time, the report says, for reabsorption into new and existing mines on the assumption that existing mines can and will be expanded to absorb these men. "At present there is no guarantee that this will be done." A somewhat gloomy picture. The report in question costs 2s. It is obtainable from H.M. Stationery Office.

Street Lighting

When local authorities were authorized to resume street lighting on the peace-time scale from next Sunday, the end of Double Summer Time, it was emphasized that the restoration of full street lighting would impose a further heavy strain on fuel supplies, and that lighting authorities should take all possible steps to ensure that they were in a position to have the lights extinguished during daylight. An examination has since been made of the labour and supplies problem involved, and it has been found that it will not be possible to make the necessary provision by July 15 owing to the acute labour shortage. In these circumstances the Ministry of Fuel and Power asks local authorities who are not in a position to ensure that their street lighting will be kept extinguished during daylight hours to defer the restoration of full scale street lighting until the necessary labour and materials are available.

Personal

Mr. G. S. EUNSON, Chairman and Managing Director of the Northampton Gaslight Company, was presented last week by his fellow Directors with a framed memento, suitably inscribed, containing the portraits of three members of the Eunson family who had between them rendered one hundred years' continuous service to the Company. Mr. John Eunson was appointed Engineer in 1845, and was succeeded in 1854 by his son of the same name. The son was Engineer and Manager until he died in 1911, when the grandson, the present Chairman, was entrusted with the management of the Company. In 1935, after 24 years of successful management, Mr. G. S. Eunson joined the Board. He was appointed Managing Director in 1936, and in 1942 he was also appointed Chairman, a dual position which he still occupies with a record of 60 years' service with the undertaking. The Board asked that the memento might be hung in the Board room as a permanent reminder of a fine family record.

* * *

Mr. A. DUDLEY HILL, Engineer and Manager of the Swadlincote Gas Department, has been appointed Engineer and Manager of the Banbury Gas Light and Coke Company, and will commence his duties on Sept. 1.

Diary

July 12.—Solid Smokeless Fuels Federation: Technical Committee, Gas Industry House, 10.30 a.m.

July 16.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.

Aberdeen Gas Department has announced increases in the price of gas. For the first 10,000 cu.ft. the charge will be 3s. 9d. per thousand cu.ft., against 2s. 10½d., and prepayment consumers will get 21 cu.ft. for a penny instead of 26. The new range of charges provides for a minimum of 2s. 2d. per thousand cu.ft. for everything above three million cu.ft., compared with the present minimum of 1s. 8d. on everything over one million cu.ft.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

Obituary

Thomas Carmichael—Appreciations

Thomas Carmichael never sought the limelight. Indeed most of his good work in the Gas Industry and outside was done quietly and unobtrusively. Nevertheless, it seems appropriate that some small appreciation of his successful work and sterling qualities should mark his unexpected and untimely death.

A brilliant engineer and administrator, a hard worker and a generous—if at times exacting—chief, "T. C.," as he was known to hundreds of gas men, was above all an honest man and a willing helper of those in adversity. His sensitive nature and keen sense of humour and of fair play made him at all times a firm friend, a delightful companion and a true sportsman. The progress of the Portsmouth Company during the 26 years of his management is a monument to his skill and devotion to duty, in which he proved himself both a most capable engineer and a sound business man. But all his schemes for the success of the undertaking were accompanied by plans for the welfare of the employees, and above all, of the pensioners, for whom he always had a special regard.

Mr. Carmichael's work for the Gas Industry was extensive and thorough. As Chairman of the Southern District of the National Gas Council and as a member of many other organizations, his services were greatly valued and his advice was eagerly sought and readily given. As Southern Regional Gas Engineering Adviser he performed a "war job" of the first importance. The Mutual Aid Scheme which he inaugurated was of great assistance to undertakings in the region which, like his own, suffered air raid damage. But the crowning achievement of his labours for the Industry, and the one which he most enjoyed, was probably his work as Hon. Secretary for 14 years of the Southern Regional Gas Industrial Council. It is not too much to say that Mr. Carmichael's tact and reputation for straight dealing made an immense contribution to the good feeling which has for so long existed between management and labour in the south. To The Institution of Gas Engineers, whose Gold Medal he was awarded in 1928, Thomas Carmichael gave three periods of service on the Council as well as much committee work, and it was a matter of great regret to his many friends that in 1938 he was compelled, on medical advice, to decline the unanimous invitation of the Council to accept nomination as Vice-President.

This brief sketch indicates a full life, but to it must be added an amazing list of activities in the City of his adoption. As a Magistrate, Hospital trustee and manager, past President of the Chamber of Commerce and a member of many committees, ranging from Welfare and War Savings to Service Canteens and Sports Clubs, Mr. Carmichael gained the esteem and gratitude of his fellow citizens, to which the attendance at his funeral and memorial service bore eloquent testimony. "T. C." will be sadly missed by a host of friends, by the Gas Industry and the Companies with which he was connected, by the City of Portsmouth, and—which would probably have pleased him most—by the employees and pensioners of the undertaking which was his chief interest.—S. E. W.

The sudden and unexpected death of Mr. THOMAS CARMICHAEL has come as a great shock to his many friends who saw him so recently, apparently in the best of form, at the Institution of Gas Engineers' annual meeting in London. It is hard to realize that the resonant voice which proposed the vote of thanks to his friend and colleague the President is for ever stilled.

Mr. Carmichael may be said to have been born into the Gas Industry, being the eldest son of the late Mr. James Carmichael, a much respected Engineer and Manager of the Barrhead Gas Company. He served an engineering apprenticeship in the fitting shops and drawing office of the Barrowfield Ironworks, Ltd., Glasgow, thereafter joining the service of the Glasgow Gas Department at their Tradeston gas-works. After a spell obtaining experience in the fitting shops and retort houses he was transferred to the drawing office, and was closely concerned with the construction of the first installation of 144 Wilson vertical retorts at Dawsholm works. His technical training was acquired at the Royal Technical College, Glasgow, where he was a distinguished student. Leaving Glasgow in 1914 he served for four years with the Nottingham Gas Department, first as Superintendent at Eastcroft works and later as the Superintendent of the Basford works. Appointed Assistant Engineer at Portsmouth in 1918 his promotion was very rapid through the stages of Chief Engineer, Engineer and General Manager to the position latterly occupied as Deputy Chairman and Managing Director.

In the early days of the Scottish Junior Gas Association (Western District) he took a prominent part, being President for 1914–15, and to all then associated with him it was obvious that he was destined to take a high place in the Industry of his choice, for he had all the qualities which make the complete man, enthusiasm, keen interest, wide-based knowledge and a natural aptitude for dealing with affairs on a big scale. In his person he had a natural charm of manner; a great capacity for friendship, making friends easily and keeping their attachment because of his unfailing interest in their concerns. Of this there can be no better indication than that although to some

few people he may have been Mr. Carmichael, to the great majority he was simply Tom Carmichael, and he had no wish for other title.

He gave great service to the Industry in all its various regional and national organizations and was a Director of many gas companies, never sparing himself in his endeavour to raise the status of and improve the service provided by the Gas Industry. He was guide, philosopher and friend to many men now occupying prominent positions who can testify to the value of the instruction and experience obtained at his hands. Notwithstanding that he had accomplished so much there was every reason to expect that still greater accomplishments lay ahead, and it is a real tragedy that his death at the early age of fifty-eight has deprived the Industry of the infinite potentialities and possibilities of his maturer powers. To his widow and to his sister and brothers the heartfelt sympathy of all connected with the Industry goes out in this time of trial and bereavement.—DAVID FULTON.

The funeral service at Christ Church, Portsdown, was attended by a very large number of Mr. Carmichael's friends and colleagues in the Gas Industry and in the public life of the City. There was again a large attendance at the memorial service in Portsmouth Cathedral on July 3. High tribute was paid at both services to his sterling character, his devotion to his profession, and his services to the public.

South Wales Exhibition

The South Wales Gas Kitchen Exhibition at Cardiff has been a triumph of co-operation between the British Gas Council and the gas undertakings in the South Wales district. When the success of the Kitchen Planning Exhibition at Dorland Hall, London, led to plans being made for it to tour the provinces, obvious difficulties arose in connexion with transport and re-assembly. Its first move was to Kingston-on-Thames, where, with the assistance of Bentalls' experienced craftsmen and the co-operation of the Wandsworth and District Gas Company and the Hampton Court Gas Company, it was successfully re-erected for a month's showing. When it was moved to James Howell & Co.'s Stores at Cardiff, however, no similar skilled assistance was available, and except for one sign-writer and two electricians who rendered part-time help, the exhibition was rebuilt and repainted and special additional features, including a working kitchen for Ministry of Food demonstrations, were introduced entirely by employees from South Wales gas undertakings, including Cardiff, Swansea, Neath, Port Talbot, and Barry, under the supervision and guidance of the British Gas Council.

The exhibition was transported from London to Cardiff by road in 18 three-ton and five-ton lorries, and in three weeks it was ready for the opening ceremony. The efficient organization, ably guided by Mr. R. J. Auckland, the District Chairman, resulted in enthusiastic co-operation by the District members and in first-class workmanship on the construction of the exhibition and the staffing of the exhibits. Effective publicity matter was supplied by the British Gas Council, and the final result was widespread publicity for the Gas Industry in South Wales.

The opening ceremony was performed by Lady Webber, supported by the Mayors of seven municipalities, the Chairmen of the Cardiff branch of the Women's Gas Council, and members of local authorities. Over 6,000 visitors attended the exhibition during the first four and a half days, excluding the opening day, and daily attendances of 2,000 have been attained.

The *Daily Herald* Post-War Homes Exhibition at Dorland Hall was opened by Lord Woolton, who is here seen inspecting the latest Regulo New World Table Top model cooker, No. 345.

Western Juniors

The Western Junior Gas Association held their Summer Meeting at Minehead on June 23. Members assembled at the showrooms of Minehead Gaslight & Coke Company, where they were welcomed by Mr. S. B. Jones, Engineer and Manager and a past President of the Association. Members were taken by motor-coach to Dunster, where an enjoyable couple of hours were spent in a tour of Dunster Castle. They enjoyed the special privilege of having the owner of the Castle, Mr. Lutterell, as their guide for the interior portion of the castle.

The President, Mr. A. B. Horsfield, expressed the Association's appreciation of Mr. Lutterell's kindness, and a general vote of thanks, which was carried with acclamation, was proposed by Mr. J. E. Ackroyd.

After the tour members returned to Minehead and were entertained at tea through the kindness of the Minehead Company, Mr. A. J. Venn, Director, and Mr. S. B. Jones acting as hosts.

A vote of thanks to the Minehead Company and to Associated Gas and Water Undertakings, Ltd., for their hospitality was proposed by Mr. A. R. Langford and seconded by Mr. O. Pincock, Mr. Jones responding.

Wales and Monmouthshire Juniors

The Annual General Meeting of the Wales and Monmouthshire Junior Gas Association was held at the offices of the Newport Gas Company on June 28. Mr. W. R. Branson, President, was in the chair, and Mr. J. F. Rust, Engineer of the Newport Company, welcomed the Association.

The Report of the Council for the 1944/45 session was presented by the President. In moving its adoption Mr. S. D. Coole (Barry) referred to the award of the Silver Medal by the Society of British Gas Industries to the President for his Paper, "Post-War Domestic Fuel Policy with Particular Reference to South Wales." The motion was seconded by Mr. W. E. Crowley (Newport) and carried unanimously.

The following officers were elected for the 1945/46 Session: *President*, K. M. Ernest (Cardiff); *Senior Vice-President*, D. E. Wilkins (Swansea); *Junior Vice President*, D. I. Rowlands (Caerphilly); *Hon. Librarian*, H. S. Bartlett (Cardiff); *Hon. Treasurer*, B. J. Bell (Cardiff); *Hon. Auditors*, Messrs. C. E. Banham and T. Noall (Cardiff); *Hon. Secretary*, D. J. Heycock (Port Talbot). *Members of Council:* Messrs. P. J. Pride (Swansea), J. Viney (Cardiff) and S. G. Meade (Newport).

The following were elected new members: Messrs. W. J. Burns, E. S. Long, and F. P. Arthur, all of Caerphilly.

After the meeting the members inspected the model gas kitchen at the Newport showrooms. A vote of thanks to the Directors of the Newport Company was proposed by the President and carried unanimously.

Manchester Juniors

After an interval of five years, the practice of holding a Ladies' Day was resumed at Southport on June 29, when over 200 members of the Manchester and District Junior Gas Association and their ladies took part in the visit. The members assembled in the Showrooms, and were welcomed by Mr. J. L. Anderson and his staff. Mr. D. Benson, President, suitably acknowledged the welcome.

Most of the ladies then visited places of interest in the town, but some elected to visit the works, together with the members. A tour of inspection was made at the works, particular interest being shown in an automatic H. & G. water-gas plant which was nearing completion, a W.-W.D. detarrer and an activated carbon benzole plant.

The parties reunited at Salt's Café, where tea was served at the invitation of the Southport Gas Committee. Expressing thanks to the Southport Corporation, Mr. Benson said that it had been a delightful meeting, and was a wonderful close to a most successful session.

Mr. H. C. Applebee, proposing a vote of thanks, said that everything possible had been done to make the visit a success. Mrs. D. Benson, wife of the President, seconded the vote of thanks. Responding, Councillor Hughes, Chairman of the Gas Committee, remarked that it was an extra pleasure to have the ladies present. He suggested that an afternoon was far too short and that the members should spend a week-end in Southport. The Deputy-Chairman, Councillor Wilkinson, spoke of the pleasure it had given him to be present, and hoped that the Association would visit Southport again when conditions were more normal.

A Recommendation from the Housing Committee that electric cookers, refrigerators, and wash boilers should be installed in all the Council's temporary houses led to a lively discussion at the June meeting of the Hereford City Council, and an amendment moved by the Chairman of the Gas Committee to substitute the word "gas" for "electricity" was carried by 15 votes to 4. The mover of the amendment said that if the original recommendaton were adopted Hereford would be the only municipality owning a gas undertaking to adopt an electric service.

Waverley Association of Gas Managers

The Annual Meeting of the Waverley Association of Gas Managers was held in the Y.M.C.A. Hall, Edinburgh, on June 22, Mr. J. JAMIESON, Edinburgh, the President, in the Chair.

The minutes of the last annual meeting were read by the Secretary, Mr. R. J. PHILP, and apologies were intimated from various members and from office-bearers of kindred societies.

The President intimated that since the last meeting the following had died: Alexander Dow, formerly of Galashiels and a former President of the Association; A. S. Nisbet, formerly of Paisley and a former President; J. S. McGill, late Manager at Slamannan. In addition two extraordinary members had died in Allan Hannah, of J. G. Stein & Co., Ltd., and J. Nelson, of Associated Lothian Coal Owners, Ltd.

The following new members were announced: D. V. Reid, Gourock; John H. Jamieson, Kirkcudbright; H. McPherson, Newmilns; Alexander Jamieson, Johnstone; John Richmond, Fauldhouse; J. Dymock, Millport; C. R. Trotter, Kennoway; William Sheach, Beith; and A. M. Traill, Berwick-on-Tweed. It was also intimated that Charles Balfour, of D. Grant & Co., Ltd., had been admitted as an extraordinary member.

Election of President

On the motion of the PRESIDENT, Mr. Harold Robinson (Annan) was unanimously elected as the incoming President and briefly returned thanks for the honour conferred upon him.

Mr. R. J. Philp was re-elected Secretary and Treasurer, and Messrs. Mitchell (Haddington) and Hardacre (Berwick-on-Tweed) were elected to the Committee for a period of two years. Mr. J. O'Halloran was reappointed Auditor.

Thereafter the President delivered his Address (see p. 55).

Mr. JAMIESON presided at the luncheon in the North British Station Hotel and read a letter from Sir P. J. Dollan, Glasgow, who was to have proposed the toast of "The Gas Industry." Sir Patrick said: "I regret that unexpected calls to important duties in the West prevent my attendance. I had hoped to be present to congratulate the Gas Industry, especially in Scotland, on its efficiency and economy. No industry has reached such a high standard of efficiency in the use of coal as the Gas Industry. All who are connected with it have earned the gratitude of thinking people for their successful efforts in fuel use and saving during the war. The Gas Industry has made one of the most outstanding contributions to the winning of the war, and is an example to all others in the intelligent use of coal and its by-products. I hope other industries will follow your example, because next winter will be the most difficult for fuel that Scotland has known for many years. Output in Scotland has fallen by nine million tons a year, while the demand is increasing."

Deputizing for Sir Patrick, Bailie ADAM MILLAR, O.B.E., J.P., Convener of Edinburgh Corporation Gas Department, proposed the toast. He paid tribute to the pioneers of the Waverley Association. Dealing with the future of the Industry, Bailie Millar said he felt there were too many single units. The community had to come first and the personnel second, and some form of integration was needed. Regional development would cut out waste. If they intended to survive as an Industry they had to attract the best type of men, men of technical and scientific skill; and a higher remuneration was called for. He envisaged a political Parliament to plan schemes, and an industrial one to make conditions of service and carry out the schemes.

Mr. J. JAMIESON, responding, said that the Gas Industry was now processing about 20 million tons of coal a year, and providing some 1,600 million therms of gas and 9 million tons of coke for sale. These two fuels, through their greater efficiency were replacing in use at least 40 and 10 million tons of coal respectively, a net saving in coal annually of 30 million tons. Translated into terms of manpower, this meant that at a modest estimate, at least 100,000 underground pit workers had been released from uncongenial toil and corresponding employment had been provided on the surface. Apart from its value in the immediate war effort, was this not a great humanitarian achievement? Of all the gifts that Nature had bestowed upon Great Britain with exceptional favour, there was none that conferred more distinctive benefits upon the nation than the gift of coal, and yet there was none that ignorance has more wantonly squandered. In the future, science and industry would become more and more the foundations of national security, and the basic need of all industry was fuel—fuel for power and heat and light. The carbonizing industries had already massive achievements to their credit. Beyond these, they visualized for the future smokeless cities, clean and labour-saving homes, and the production from coal of gaseous, liquid, and chemical products which would create a new revolution in their industrial and commercial economy.

Mr. DAVID FULTON (Helensburgh) proposed "Kindred Associations," and Mr. ALEXANDER JAMIESON (Johnstone, President of the North British Association) replied.

The health of the Chairman was proposed by Mr. R. FIFE (Kilmarnock), and Mr. JAMIESON briefly replied.

Mr. W. M. HENDERSON (Dalkeith, Immediate Past President) in lieu of the usual Medal, presented Mr. Jamieson with a silver tankard as a souvenir of his term in the Chair, and Mr. JAMES DICKSON (Kirkintilloch), moving a vote of thanks to Mr. Jamieson and the Committee, expressed his appreciation of all the services rendered to the Industry by their President.

British Commercial Gas Association

Immediately after the annual and special general meetings of the National Gas Council on June 14 (as reported in the "JOURNAL" of June 20), the British Commercial Gas Association held its 32nd annual general meeting and a special general meeting, at which the rules were amended in similar terms to those approved by the National Gas Council so as to give the British Gas Council the necessary powers to carry on the business formerly transacted by the Association. Mr. Frank H. Jones presided.

Mr. P. J. LUCAS, Secretary, presenting a resumé of the annual report, which covered the work of the Association over the past three years, said the Association had an unusual role to play during the war in Europe, inasmuch as the appeal to the public had to be to save gas and not use more than was absolutely necessary. This called for a certain amount of dexterity in their advertising, but in retrospect it could be said that the task was successfully accomplished. Publicity would require to be employed with renewed vigour in the future so that with the improved standard of living at which the nation aimed, the public should have full knowledge of the benefits to be derived from scientifically prepared fuel and scientific fuel utilization. Side by side with this the Industry must always be vigilant to adopt progressive commercial ideas and practices. The Domestic Development Committee had shown its worth in the successful handling of negotiations with the Government on the housing problem, and had rendered invaluable service to members.

In adopting the report, the members expressed their unanimous invitation to Mr. A. W. Smith and Mr. D. H. Helps, who had retired, to become Vice-Presidents of the Association.

Thanks were accorded to Councillor S. J. Perry (who was unable to attend owing to pressing engagements at Leicester) for continuing in office as President for the past three years, and he was unanimously re-elected for the ensuing year.

Messrs. Cash, Stone & Co. were reappointed the Association's Auditors for a further term.

In opening the special general meeting, the CHAIRMAN said a memorandum setting out the proposed alteration to rules had been circulated. Members would already know that the Executive Committee of the B.C.G.A. and the Central Executive Board of the N.G.C. had agreed in the early part of the year to meet together as one body known as the British Gas Council. Until the constitution of the British Gas Council could be brought into force, after approval by the Industry, it was necessary to make this arrangement valid. To meet the situation two eminent counsel and Mr. S. E. Cash, Solicitor, had carefully considered the existing constitution and rules of the B.C.G.A., and in their opinion the proposed alteration would give the Association and the British Gas Council the necessary powers in the meantime.

Mr. J. W. BREARLEY said that on behalf of the Yorkshire District he had been instructed to request that the Executive Board of the British Gas Council should be composed of representatives of each of the Districts, and if necessary it should be increased in numbers to make possible the fulfilment of this suggestion.

After full discussion, Mr. BREARLEY said he would withdraw his proposition, following the Chairman's statement that the British Gas Council would give the views of the Yorkshire District full consideration when the appointment of committees came under review.

Mr. C. H. LEACH seconded the Chairman's proposition that the alteration of rules should be approved, and it was carried unanimously.

In Our Report of the proceedings at the annual meeting of the Institution of Gas Engineers ("JOURNAL" of June 20) we stated that the seconder of the omnibus vote of thanks at the conclusion of the meeting was Mr. T. S. Moffatt, of Rothesay. This should have read, of course, T. S. Lockhart, to whom we apologize for the error.

A New Leaflet on the various applications of "Onx" patching cement has been issued by Algernon Lewin Curtis, Westmoor Works, Chatteris. Pointing out that no single type of fire cement can be suitable for all purposes, it explains how a suitable "Onx" cement is manufactured for each individual order, particular reference being made to the patching of horizontal retorts.

Dursley Gas Light and Coke Company placed half its showrooms at the disposal of the Red Cross and St. John War Organization in December, 1943, for conversion to a Red Cross Gift Shop. In the 18 months to the end of June, when the fund was closed, over £2,500 was raised. The Company has received an expression of grateful thanks from Mr. H. J. Lewis, Chairman of the Gloucestershire Joint Committee, for its generous co-operation.

New Carbonizing and Ancillary Plant at High Wycombe

As reported in the "JOURNAL" of June 27 an installation of Glover-West continuous vertical retorts was officially inaugurated at the High Wycombe Works of the Uxbridge, Maidenhead, Wycombe and District Gas Company on June 20. The following particulars are taken from a brochure prepared for the occasion.

A movement to provide a gas supply for Wycombe was initiated by a group of men in 1848. In 1849 the output of gas was 878,000 cu.ft., and in that year the Company secured the first lighting contract for 35 street lamps. The population of High Wycombe was then 3,588 with 702 houses. Ninety years of steady progress brought the demand for gas during last year to 526 million cu.ft.

The horizontal retort house, comprising six beds of eight retorts 20 ft. long and 23 in. by 16 in. in cross section, which has now been superseded by the continuous vertical retort installation, was built in 1911.

In 1920 the Wycombe Gas Company was absorbed by the Uxbridge Gas Company, and with the increasing use of gas for cooking and heating, the output curves of the Company began to show a greater tendency to heavier peak loads, particularly at Sunday mid-day and during cold spells, and it was desirable to have gas-making plant which could be rapidly brought into operation for short periods. To meet this requirement a carburetted water gas set capable of making 650,000 cu.ft. a day was installed in 1927. A duplicate set was introduced in 1933. Associated with the water gas plant was a new range of three Lancashire boilers capable of burning coke breeze and providing power and process steam for pumps, boosters, and for gas-making.

To cope with the increased amount of gas manufactured, the need for new purification plant was evident, and two boxes were installed in 1927 and duplicated in 1932. During this period additional wet purification plant was erected for the extraction of ammonia.

The reception of population from the bombed areas of London in 1940 and 1941, coupled with the greatly increased demand for gas for industrial purposes by factories engaged on essential war production, exerted a tremendous strain on the Company's manufacturing resources. It was obvious that new gas-making plant to replace the old horizontal retorts which were rapidly becoming redundant, and to provide increased capacity, must be installed if the gas supplies were to be maintained. Accordingly, the Ministry of Fuel and Power gave permission in November, 1942, for the erection of the modern installation of continuously operating vertical retorts. The Mayor, Aldermen, and Burgesses of the Borough of Chepping Wycombe requested that any new carbonizing plant should be of a type which would eliminate or reduce smoke to negligible proportions, to which request the Company readily acceded.

Special Features

The special features of the plant may be summarized as follows: The retorts are 25 ft. in length, expanding in cross-section from 50 in. by 10 in. at the top to 56 in. by 16 in. at the base. They are comparatively large-gas-making units, and the 16 set in two beds of eight will on maximum throughput produce close upon 1½ million cu.ft. of gas a day. From the layman's point of view, perhaps the most interesting feature is the attempt to produce in an essentially industrial building a pleasing architectural appearance. The steel framework of the building has been encased in brickwork, and the coal-receiving annexe and coke hoppers are built as integral features of the main building. A liberal use has been made of steel-framed windows for producing maximum natural lighting and ventilation. Parapets with "Snowcrete" coping form a pleasing finish to the skyline, and hide to the maximum degree the two steel chimneys. Rainwater fall pipes are not visible, being taken down internally. Up-to-date lobbies with shower-baths, washing and changing accommodation have been provided for the shift workers operating the retort house, and as soon as circumstances permit, similar amenities are to be furnished to replace those which are now inadequate for the men engaged on other parts of the works.

The retorts are heated by producer gas generated in two external producers, and all mechanical plant is electrically driven with the exception of the steam turbine driving the waste-heat boiler fan and the steam engine standby for the coke extractor drive.

The coke screening plant removes the breeze or fine coke, then takes out the "nuts," next the coke for large stoves and open fires is separated, and finally the large coke for industrial purposes. The several sizes are collected in hoppers below, which store a total of 150 tons of graded coke, and facilities are provided for the rapid loading of lorries in bulk or the automatic weighing and bagging of coke for domestic use. A high-frequency vibratory screen is fitted on the travelling bagging machine so that any fines resulting from breakage during storage are removed before bagging for sale.

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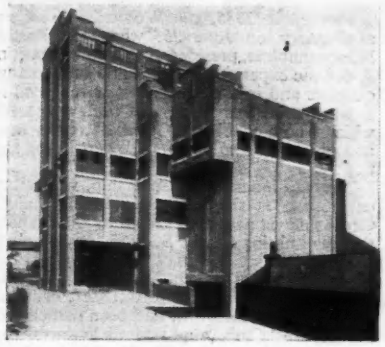


The Vertical Retort House—Coke Hopper Side.

War Effort

Besides providing vital factories with large quantities of gas for process heating, and maintaining canteen and domestic heating and cooking services so essential to the maintenance of morale under wartime conditions, the Company has made a special contribution in the manufacture and compression of hydrogen for the balloon barrage in the Metropolis and other key areas. From 1942 to September, 1944, the passage of R.A.F. trailers with their stacks of steel cylinders was a familiar sight in High Wycombe, as they came to replenish supplies from the works. The plant designed for the production of hydrogen was built by the Air Ministry, and sited largely on the Company's property. Its management and control were entrusted to the technical staff of the works. Although some men had to be recruited from other sources, the plant was largely manned by the Company's personnel. Employees whose normal work had been gas-fitting rapidly adapted themselves to their new role, and the whole project was ably managed and controlled by the resident Gas Engineer, Mr. W. W. Chisholm.

The new retort house and its ancillaries now form the nucleus of works plant round which the Company anticipates in the course of time completely to remodel the works, providing, in addition, offices and workshops to replace those which have now outlived their usefulness, and need extension and modernization commensurate with the development of the Company's business.

Gas Lamp Standards are being erected in Woodhead Park, Kirkintilloch, for open-air dancing during the local Holidays-at-Home week.

It is believed that boring in the Drumlembie area of Campbeltown has shown the coal there to be of good cannel quality, suited to the industrial market. An assurance has been given the area that houses will be provided to take the miners' families if the Glasgow Coal Company interested decides to proceed with the mining of the seams.

Criticism of the Government's failure to investigate oil from coal processes when these were noted nine years ago by a Committee of which he was Chairman was made by Professor W. N. Cumming, of the Department of Chemistry, Royal Technical College, Glasgow, when he spoke on "The Uses of Coal" to the Glasgow Rotary Club on June 19. He urged the cessation of the burning of raw coal, and thought that public opinion should be gradually moulded towards that end.

The Town and Country Planning Association circulated to all election candidates and to headquarters of all Parties a document entitled "Key Points in Planning Policy." The notes emphasized that until a policy of planned decentralization—encouraging industry to settle in new and existing country towns—is put into operation, cramped living conditions will continue in the centres of cities, and suburban building, with all its disadvantages, will further increase the size and spread of our towns.

The House-Designing and Building Competition organized by the House-Building Industries' Standing Committee closed on June 30. This was a National Competition for builders who are members of the National House-Builders' Registration Council, and they were asked to design a pair of three-bedroomed houses, or alternatively one having two and one having four bedrooms. For the purpose of preliminary adjudication the country has been divided into three Group Areas for which committees of architects and builders have been nominated. From the plans which are selected houses will immediately be built, and it is hoped that they will be on view to the public before the end of the autumn. This drive on the part of the house-building and allied industries is designed to demonstrate the type of small house of the two, three, or four-bedroomed type, which it is hoped will be available (as soon as labour is released) to the younger married couples who wish to invest their savings in their own house, as well as providing houses to let at nominal rents.

Women's Gas Council

Formed in 1935, the Women's Gas Council celebrated its tenth anniversary on June 25, when the President, the Dowager Lady Nunburnholme, presided at the annual meeting at Gas Industry House. A definite expansion of work and broadening of interest both at headquarters and in the branches was recorded in the annual report, and it was stated that plans had been prepared for future development which would enable the Council to carry out more effectively its aims and objects and to play its full part in the task of national reconstruction.

The headquarters membership was augmented by several new enrolments at the Kitchen Planning Exhibition early in the year. Great interest had been shown by the branches in various war efforts, such as knitting for the Services, sewing parties for the relief of overseas children, collection of prisoner of war parcels, savings campaigns, entertainment of patients in military hospitals, &c. A new branch was inaugurated at Rochford, Essex, in January; another new branch in Scotland, at Renfrew, had been named the "Women's Gas Council Housewives' Club," and preliminary arrangements had been made for a branch at Cannock. The W.G.C. publications, *Fanfare* and *I Pass This on to You*, had been in increasing demand.

The Council is represented by its Secretary on the British Gas Council, and has submitted evidence to the Committee of Enquiry into the Gas Industry. During the year it has worked in co-operation with the Ministry of Fuel and Power in connexion with the fuel economy campaign, and it also took a prominent part in the Kitchen Planning Exhibition. Photographic copies have been made of the 12 panels comprising the W.G.C. pictorial exhibition "Gas and the Modern World," which was presented last year to the A.B.C.A. for circulation to the Forces. These photographic exhibitions are constantly in demand by Army Educational Centres, the Services, and other organizations. In collaboration with the B.C.G.A. two panel exhibitions have been produced, and copies have been presented to the Women's Forces and the National Association of Training Corps for Girls. One, "Morning, Noon, and Night," gives a colourful presentation in large panels of the fuel services in the average home, and the other, a historical display, shows the medieval and eighteenth century methods of munition making, glass blowing, laundry work, bakery, science, and medicine, and, in contrast, "How gas does the job to-day."

The report also lists a large number of national organizations, such as the National Council of Women, the Women's Advisory Housing Council, and the Women's Group on Public Welfare, with which the Council has actively co-operated during the year, and announces with regret the formal resignation of Miss Halpin from the position of Organizing Secretary on her being seconded to the Ministry of Health as the Government's Alternate Delegate on the Welfare Committee of U.N.R.R.A. Mrs. Abbott, who has been Acting Secretary since 1941, has been appointed Organizing Secretary in Miss Halpin's place.

Lady Nunburnholme announced with regret at the meeting that Miss Wolseley-Lewis had decided to resign from the Chairmanship of the Council, a position which she has held since the formation of the W.G.C. On behalf of all the members, Lady Nunburnholme expressed appreciation of the excellent work done by Miss Wolseley-Lewis, and hoped she would continue to take an interest in the Council and consent to become a Vice-President.

Lady Nunburnholme was re-elected President, and the Vice-Presidents were re-elected with the addition of Miss Elizabeth Denby, Lady Egerton, Miss P. L. Wingfield (Principal, Edinburgh College of Domestic Science) and Miss Wolseley-Lewis. Among the newly elected members of the Executive Committee is Mrs. A. E. Sylvester.

Miss Wolseley-Lewis, in a speech in which she reviewed the work of the Council during the past ten years, stressed the importance of educational plans for young people, the housewives of to-morrow.

A vote of thanks to Miss Wolseley-Lewis was proposed by Miss Halpin and seconded by Mrs. Darcy Braddell.

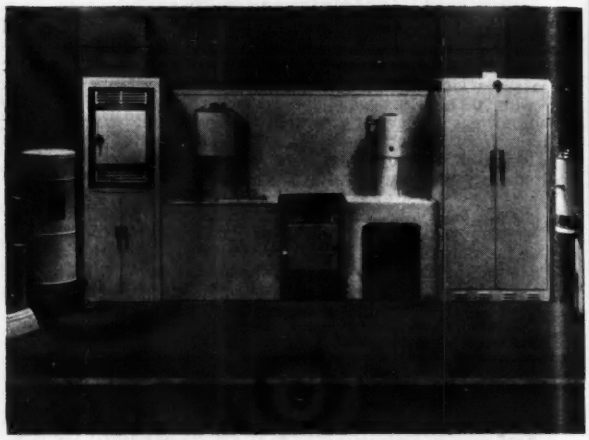
A London member proposed that thanks should be conveyed to the men of the gas-works who during the blitz had done such magnificent and courageous work. This proposal was enthusiastically received by the large audience and carried unanimously.

Kitchen Display at Chesterfield

With the co-operation of other municipal departments, the Chesterfield Gas Department has staged a very attractive kitchen planning exhibition at its Knifesmithgate showrooms. One of the main features is the Chesterfield gas dining-kitchen, with larder and utility room adjoining. The whole unit conforms to the requirements of the Ministries of Health and Works, and incorporates several novel labour-saving and fuel economy features. There is a hot-water section of the exhibition showing five different types of water heaters, all working, ranging from a sink heater to a large unit for central heating and complete hot-water service. A section which attracts considerable notice is devoted to local gas-using industries, for which the Department, managed by Mr. C. S. Davies, who succeeded his father in that position, was called upon to meet abnormal demands during the war period.

There are daily film shows and cookery demonstrations, and neighbouring local authorities, local women's organizations, and other bodies are showing great interest in the exhibition. The Parks Department has co-operated by laying out a front garden in the main showroom window, consisting of beds in full flower, borders, flagged walks, rockeries, and a fish pool.

The exhibition was opened by Councillor F. S. Short, Chairman of the Gas Committee, in the presence of the Mayor and other Members of the Council. It is to remain open for three months, with periodical changes to maintain interest, and already more than 30,000 people have attended.



A well-designed display of gas kitchen appliances formed part of an exhibition arranged by the Redditch Gas Company in conjunction with the Urban District Council. The display featured a Radiation built-in cooker, water heater, gas iron, &c.

Home Management Courses

Home Management Courses for married members of a local Anti-Aircraft Regiment who are due for release from the services within the next few weeks are being run very successfully at the Middlesbrough Gas Showrooms. A.T.S. Auxiliaries are given practical cookery classes. A special lecture is arranged for them on rationing—to help them when they run their own homes. A period is devoted to the kitchen layout, and stress is laid on kitchen planning and equipment. For this purpose the Middlesbrough model kitchen, erected some time ago in the gas showrooms, proves a very useful basis for study.

The Institution of Chemical Engineers, the Institute of Physics, and the Chemical Engineering Group of the Society of Chemical Industry announce that the joint conference on "Instruments for the Automatic Controlling and Recording of Chemical and Other Processes," which was postponed last September, will take place in the Royal Institution on Oct. 19. The purpose of the Conference is to promote the interchange of knowledge and experience between those using automatic controllers and recorders in different fields and to encourage collaboration between physicists and chemical engineers. The Conference will be open to all interested without charge, whether members of the organizing bodies or not.

The Gas Industry's Contribution to Post-War Housing

By L. W. ANDREW, B.A., B.Sc., A.R.I.C., E. W. B. DUNNING, B.Sc., A.R.I.C., and G. C. HOLLIDAY, B.A., Gas Light and Coke Company

(*Concluded from p. 25*)

APPENDIX 1.—Coal Conservation

In the tables in Section V, figures are given showing the annual net coal required for producing the gas and coke; they have been derived as follows:

Allowing for the thermal value of the by-products* tar, benzole, &c., produced during carbonization, on the average each 2 tons of coal processed at the gas-works ar present produces 150 therms of gas and 1 ton of coke for sale. If this ton of coke did not go into the solid-fuel market it would have to be replaced by mining at least one extra ton of coal. Thus the production of 150 therms of gas can be regarded as having used up only 1 ton of the nation's solid fuel resources—*viz.*(1)

1 ton of coal gives 150 therms gas
1 ton of coal gives 1 ton coke

2 tons of coal give 150 therms gas
+1 ton coke

Examples:

For the all-gas house (Plan 1E) consuming 565 therms a year, the net raw coal required to produce the gas is $\frac{565}{150} = 3\frac{3}{4}$ tons approximately.

For Plan 3, using 265 therms of gas and 2 tons of coke, the net raw coal required to produce the gas and coke is $\frac{265}{150} + 2 = 3\frac{3}{4}$ tons.

In a great many pre-war family dwellings where raw coal was burnt in inefficient appliances and provided the major heating needs, the coal requirement was 5 tons or more annually.

Section IV has shown that replacement of raw coal by gas and coke could substantially reduce this figure according to the standard adopted, but the service given would be far better than pre-war.

Improvement in efficiency of coal appliances is to be expected and efforts are already being made to popularize the more efficient semi-closed stoves—*e.g.*, in "Portal" houses. Provided the right grade of fuel is supplied, coke can be used in these or similar appliances and in general maintain a higher practical efficiency than coal. Practical efficiencies of gas appliances are also being further improved for post-war years so that the net coal requirement for a given service will be steadily reduced, quite apart from any increased efficiency in the manufacture of gas and coke.

APPENDIX 2.—Analysis of Space-Heating Requirements

Any theoretical considerations of space-heating requirements must be tentative, but they serve as some guide to the practicability or otherwise of the new heating standards. They must always be considered in relation to the actual practical performance of the space-heating appliances used.

Background Heating.

The amount of heat needed to maintain a house at a low level of background heating is very much less than that needed to maintain it at a higher level, and this is the essential difference between "background heating" and conventional "central heating." The amount of heat needed is approximately proportional to the number of degree days, and on this assumption the following table gives the amount of heat needed to maintain different inside temperatures of a house as percentages of that required to maintain 65°F.—the normal temperature for full comfort by central heating.

The figures refer to the South of England.(50)

Inside Temperature. °F.	Number of Degree Days.	Relative Heat Requirements, per cent.
45	250	7
50	600	16
55	1,400	37
60	2,400	63
65	3,750	100

Not only is there a very marked practical difference in heat requirements for background heating and central heating, but also between the 45°F. and the 50°F. standards for background heating.

* The Gas Industry before the war was producing per annum about—(50)
250 mill. gall. of tar (from which a great many other valuable by-products were derived).
20 mill. gall. benzole.
300,000 tons sulphuric acid.
70,000 tons ammonia.

Considerable practical importance is attached to seasonal variations in heat requirements as these variations must be met partly by modifying the length of heating period, and in addition a high degree of flexibility of heat output of the actual appliance or combination of appliances is needed.

In the following table it is assumed that the amount of heat needed will be proportional to the number of weeks in a heating period, and the difference between 50°F. and the average inside temperature for background heating, or 65°F., and the average inside temperature for topping-up heating:

Period.	Average Temperature, °F.	Number of Weeks.	Relative Amount of Heat, per cent. Background (50°F.).	Topping-up (65°F.).
1	2	3	4	5
1	40.0	7	80	27
2	47.5	7	20	27
3	52.5	8	—	25
4	57.5	8	—	15
5	62.5	9	—	6
6	70.0	13	—	—

The implications of these figures are best considered in relation to the actual heat requirement of a typical house.

Heat Requirements of a Typical House.

Egerton, in a recent Paper,(51) gives the following information:

"The heat requirements of a typical small house of normal construction in the South of England have been estimated, assuming a continuous background temperature of 50°F. in the whole house throughout 24 hours, and the living room to be topped-up to 65°F. for 9½ hours in three periods; the kitchen to be topped-up to 60°F. for 12 hours; the bedrooms to 55°F. for 2 hours in two periods; the hall to 55°F. for 15 hours; and the bathroom to 60°F. for ½ hour in one period.

8.7 mill. B.Th.U. are required for background heating to 50° F.

11.6 mill B.Th.U. are required for topping-up.

20.3 mill. B.Th.U. are required in all."

As a reasonable approximation the previous table can be used to split up these annual heat requirements into the average weekly requirements for each period of the year.

Period.	No. of weeks.	Amount of Heat Needed, Useful Therms. Background.	Topping-up.	Total.	Average Amount of Heat Needed each Week, Useful Therms. Background.	Topping-up.	Total.
1	2	3	4	5	6	7	8
1	7	70	31	101	10	4.5	14.5
2	7	17	31	48	2.4	4.5	6.9
3	8	—	29	29	—	3.6	3.6
4	8	—	18	18	—	2.2	2.2
5	9	—	7	7	—	0.8	0.8
6	13	—	—	—	—	—	—
		87	116	203			

These figures show the very wide range of heat output needed theoretically from an appliance if it is to provide the desirable seasonal heat requirements. It is not possible in this Paper to consider the figures in any detail, but attention is drawn to two quite general deductions.

Gas appliances, being flexible, have a special use as methods of providing supplementary heating in the cold weather and alternative heating in the mild weather even when coke appliances supply the major heating load.

It is misleading to attempt a calculation of annual fuel consumptions on the basis of the theoretical heat requirements for the year and the conventional thermal efficiency of appliances, unless a check is made as to whether or not the particular appliances chosen can provide the appropriate seasonal requirements. In practice the total theoretical heat requirements must be exceeded if the comfort standard is to be maintained fully at all times. This excess will decrease as the proportion of gas to coke increases. Further information is needed on the distribution of heating in a house, and in particular on the effect on the first floor of the ground-floor heating appliances.

The figures given in the text for gas consumptions of individual appliances are based on the above figures, but two additional assumptions are made:

Firstly, that the heat requirements of the living room are one-half those of the whole house,(52) and of the meals room one-quarter those of the whole house (independent calculation on a house of similar construction to the one quoted by Egerton).

Secondly, that it is legitimate to assume that the heat outputs of individual gas appliances will be reasonably close to the theoretical requirements, as these appliances will not only turn down easily, but also can readily be used for long or short periods as required.

It is realized that more data are needed; but from general experience the figures given are reasonable; also as they are based on a background temperature of 50°F. and a house of conventional construction, they allow for a fair safety margin if either a background temperature of 45° to 50°F. is acceptable or improved standards of insulation of houses are adopted.

Insulation.

The improved standard of heating, particularly background heating, has drawn attention to the value of insulation of the house. A saving of 20% of the heat requirements is readily obtained by improved insulation of a house, and Egerton justifies this on the grounds of economy to the user, excluding any national saving of fuel.([52], [69])

In a typical semi-detached house with pitched roof, tiles, battens and felt above a plaster-board ceiling, the heat loss from the first floor ceiling generally exceeds that from the walls. *Post-War Building Study No. 15: Walls, Floors, and Roofs*,([75]) shows that 68% of these ceiling losses could be saved by laying ½ in. fibre-board above the ceiling joists.

Insulation in this manner seems particularly worth while; not only is it cheap and easily applied, but it helps to ensure that the desired background temperature is maintained in the upper part of a house with little additional heat beyond that received from the ground floor rooms.

APPENDIX 3

Analysis of Water-Heating Requirements

Relation Between Bench Efficiency and Practical Efficiency.

In gas water heaters of all types, 70 to 80% of the heat value of the gas passes into the water. The factors which reduce the practical efficiency—namely, the ratio of heat content of water actually used to heat value of gas burnt—below these figures, apart from avoidable waste, are as follows:

(i) Heating-up and residual heat losses.
(ii) Standby losses and pilot consumptions.
(iii) Losses to vessels into which water is drawn.

Hot water left in the pipe and appliance will have to be run off, tepid or cold, the next time water is drawn, unless the interval is short. Lagging of draw-off pipes is not always advantageous, since the increase in thermal capacity may offset the decreased surface losses. The design of systems to keep pipe runs as short as possible, particularly to the sink, which is the most frequently used point, is the proper method of reducing this wastage; it can then be kept negligible, otherwise it may easily amount to ½ to 1 gall. at each occasion of use. With instantaneous heaters there is also at each occasion of use ½ to 1 gall. of water delivered tepid from the appliance before it is fully heated-up.

With storage heaters and circulator systems used continuously, there is only the delivery pipe to be heated at each draw-off, so that losses from the foregoing causes can be kept quite small, but there are instead surface losses from the hot storage. Self-contained storage heaters are always well lagged, and standby loss from them may be about 2 therms weekly. The loss from a lagged circulator system can also be kept down to 2 to 3 therms weekly; if unlagged it can easily reach 10 therms a week—a prohibitive figure. Lagging of the flow-and-return pipes and tank is therefore essential.

When storage heaters and circulator systems are used intermittently, being turned out when enough hot water is stored up for the remainder of the day's requirements, the standby losses can be considerably reduced. Part of the saving so obtained is expended the next day in re-heating the heater and the tepid water contained in it. If the occasions of lighting are only once or twice a week (circulator used for baths only) the residual heat in the storage may be entirely lost, and is then more conveniently considered under the heading of tepid water losses. In this case it is not possible to draw a rigid distinction between standby losses, heating-up losses, and residual heat. Pilots normally burn ½ to ¾ cu.ft. per hour—that is, 0.4 to 0.6 therms a week if continuously alight.

Heat loss to vessels is common to all heaters and all fuels, but it must be allowed for in assessing the ultimate service obtained.

Hot Water Usage.

The usages of hot water to be considered vary from 220 to 350 gall. per week. Most of this needs to be delivered either at 110° to 120°F. for wash-basin and bath use, or at 130° to 140°F. for sink use. A hot water supply at 140°F. is therefore required, and it is convenient to express the total requirements in terms of gallons delivered at 140°F. The equivalence of gallons at 140°F. to gallons at usable temperature depends on cold water temperature and all the other variable factors inherent in the hot-water load and cannot therefore be exactly assessed. The functional code, as already quoted,([35]) estimates and allocates as follows:

Bath	70 to 110 gall. at 140°F.
Basin	20 ,, 40 gall. ,,
Sink	70 ,, 100 gall. ,,

The figures given in this paper are based on tests carried out at Watson House, for which a slightly different and more detailed allocation has been assumed.

Lower Standard.

Gallons delivered at 140°F.	Use.	Gallons at usable temperature. Rounded figures.
56 × ¾ = 42	Small wash-up or diluted for ablutions.	55
21 × 1 = 21	Washing up.	20
7 × 2½ = 17½	In sink or bucket for house cleaning and incidental laundry.	25–30
80½		
4 × 10 = 40	Child's bath, 5 in. to 6 in. depth.	50–70
2 × 15 = 30	Adult's bath, 7 in. to 8½ in. depth.	40–55
150½		
2 × 5 = 10	Laundry boiling.	10
160½		200–240

Higher Standard.

42 × ½ = 21	Generally as above, with more generous allowance of small amounts and baths.	20
56 × ¾ = 42		40
42 × 1 = 42		55
7 × 3½ = 24½		30–40
129½		
8 × 15 = 120		160–220
249½		
2 × 5 = 10		10
259½		315–385

The ranges given for the larger amounts are due to the variation from winter to summer in the temperature of the cold water used dilution. To give the 220 and 350 gallon standards of service in summer only, less gallons at 140°F are required. Although water for boiling laundry (and perhaps also some of that used for culinary purposes) may be drawn from the hot water supply, it is more convenient to keep this item separate. The amounts at 140°F. for which consumptions are worked out in the tables are therefore:

Lower standard:	150 gallons	average all the year.
	145 ,,	summer only.
Higher standard:	250 ,,	average all the year.
	240 ,,	summer only.

Calculation of Fuel Requirements.

Experiments have been carried out to determine the magnitude of the factors discussed above, and these, together with direct practical checks both on drawing 220 gall. at usable temperature and also on drawing 150 gall. at 140°F., make it possible to assess what would be the gas consumption to get the standard hot-water service in practice. These consumptions have been given in Table IV. Tables VIII to XI show in more detail how they are built up. All systems are assumed to be as compact as possible, sink heaters and multipoint instantaneous heaters to be at the sink, bath heaters over the bath, storage heaters and storage tanks of circulating systems to be near the sink, or connected by pipes of small capacity. For sink instantaneous heaters, ½ gall. wastage is assumed at each draw-off; for large instantaneous heaters, 1 gall. On draw-offs over 1 gall., tepid water can generally be used, and therefore no wastage is allowed.

Summer Water Heating in "Portal" Houses.

The Ministry of Works has installed electric immersion heaters in the "Portal" houses as the only alternative method of summer water-heating. (The Domestic Development Committee has repeatedly asked for gas summer water-heating facilities to be provided in these houses, but so far without result.) A 2-kw. immersion element is fitted horizontally into the 27-gall. storage cylinder at such a level that there are 8 gall. above it. An insulating jacket covers the top of the cylinder down to 2 in. below the element. A loop, used as a towel rail in the bathroom, is connected across the flow and return pipes where they enter the cylinder.

Recently, comparative practical tests on a unit identical with the "Portal" plumbing unit, using the immersion heater and the proposed small gas multipoint instantaneous heater gave the following results: It was found that with the immersion heater, the whole of the 8 gall. above the element is heated uniformly—(*i.e.*, there is no stratification in this part of the cylinder)—and therefore it is about 2 hours before any water hot enough for normal domestic purposes can be drawn. Actual temperature rises recorded were 37°F. in 40 min., 70°F. in 100 min., 99°F. in 160 min. Thus to give service equivalent to that of the gas heater the immersion heater must be run continuously. When this is done the standby consumption alone, with no water drawn, is 53 units a week (thermostat is set at 145°F). For drawing-off the standard usage, with and without baths, the following consumptions were recorded:

TABLE VIII.—Average Gas Consumption (Therms per Week) Over Whole Year to Obtain Standard Usage of 150 Gall. at 140°F. from Feed Water at 55°F. Average.

Installation.	Sink. Useful gall. at 140°F.	Sink. Wastage, gall.	Sink. Gas Consumed.	Basin. Useful gall. at 140°F.	Basin. Wastage, gall.	Basin. Gas Consumed.	Bath. Useful gall. at 140°F.	Bath. Wastage, gall.	Bath. Gas Consumed.	Total. Useful gall. at 140°F.	Total. Wast. age, gall.	Total. Gas to Heat total Water Drawn.	Total. Pilot or Stand-by.	Total. Total Gas Consumed.	Notes.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sink heater	60	24	0.95	—	—	—	—	—	—	60	24	0.95	0.28	1.23	(1) (2)
Sink heater	60	24	0.95	20	14	0.40	—	—	—	80	38	1.35	0.28	1.63	(1) (2) (3)
Sink heater + bath heater	60	24	0.95	20	14	0.40	70	—	0.82	150	38	2.17	0.28	2.45	(1) (2) (3) (4)
Sink heater + circulator for baths	60	24	0.95	20	14	0.40	70	34	1.18	150	72	2.53	0.28	2.87	(1) (2) (3) (5)
Small multipoint	60	37	1.10	20	20	0.45	70	—	0.80	130	57	2.35	0.42	2.77	(2)
Large multipoint	60	49	1.23	20	28	0.4	70	—	0.80	150	77	2.57	0.42	2.99	(2)
Circulator (intermittent)	On for about 7 hours on 2 days and 3 hours on 5 days (rating 15,000									150	50	2.4	1.8	4.2	(6)
Circulator (continuous)	B.Th.U./hour)									150	50	2.4	3.5	5.9	
Storage (intermittent)	On for about 4 hours on 2 days and 1½ hours on 5 days (rating 30,000									150	25	2.1	1.3	3.4	(6)
Storage (continuous)	B.Th.U./hour, part of time at shut-down rate)									150	25	2.1	2.5	4.6	

Notes.—(1) Instantaneous sink heater with closed waterways. Storage sink heater gives this usage with approximately the same gas consumption although differently made up. Figures for open-type instantaneous not yet available.
(2) Pilot 16 hours a day.
(3) Water for use at basin drawn from sink heater.
(4) No permanent pilot on bath heater.
(5) Wastage includes tepid water left behind in system after use of circulator on bath nights.
(6) Impossible to itemize for these installations. Tepid water left in storage continues to lose heat by surface losses but at a slower rate. At next lighting some of its heat content is made use of. General assumption for intermittent lighting is that heater will be turned out as soon as enough hot water is stored for remainder of day's requirements.

TABLE IX.—Average Gas Consumption (Therms per Week) Over 22 Summer Weeks to Obtain Standard Usage of 145 Gall. at 140°F. from Feed Water at 69°F. Average.

Installation.	Sink. Useful gall. at 140°F.	Sink. Wastage, gall.	Sink. Gas Consumed.	Basin. Useful gall. at 140°F.	Basin. Wastage, gall.	Basin. Gas Consumed.	Bath. Useful gall. at 140°F.	Bath. Wastage, gall.	Bath. Gas Consumed.	Total. Useful gall. at 140°F.	Total. Wast. age, gall.	Total. Gas to Heat total Water Drawn.	Total. Pilot or Stand-by.	Total. Total Gas Consumed.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sink heater	60	24	0.84	—	—	—	—	—	—	60	24	0.84	0.28	1.12
Sink heater	60	24	0.84	20	14	0.34	—	—	—	80	38	1.18	0.28	1.46
Sink heater + bath heater	60	24	0.84	20	14	0.34	65	—	0.65	145	38	1.83	0.28	2.11
Sink heater + circulator for baths	60	24	0.84	20	14	0.34	65	34	0.97	145	72	2.15	0.28	2.43
Small multipoint	60	37	0.97	20	20	0.40	65	—	0.65	145	57	2.01	0.42	2.44
Large multipoint	60	49	1.09	20	28	0.48	65	—	0.65	145	77	2.22	0.42	2.64
Circulator (intermittent)	On for about 7 hours on 2 days and 3 hours on 5 days (rating 15,000									145	50	2.1	1.5	3.6
Circulator (continuous)	B.Th.U./hour)									145	50	2.1	3.1	5.2
Storage (intermittent)	On for about 4 hours on 2 days and 1½ hours on 5 days (rating 30,000									145	25	1.8	1.2	3.0
Storage (continuous)	B.Th.U./hour, part of time at shut-down rate)									145	25	1.8	2.2	4.0

TABLE X.—Average Gas Consumption (Therms per Week) Over the Whole Year to Obtain Standard Usage of 250 Gall. at 140°F. from Feed Water at 55°F. Average.

Installation.	Sink. Useful gall. at 140°F.	Sink. Wastage, gall.	Sink. Gas Consumed.	Basin. Useful gall. at 140°F.	Basin. Wastage, gall.	Basin. Gas Consumed.	Bath. Useful gall. at 140°F.	Bath. Wastage, gall.	Bath. Gas Consumed.	Total. Useful gall. at 140°F.	Total. Wast. age, gall.	Total. Gas to Heat total Water Drawn.	Total. Pilot or Stand-by.	Total. Total Gas Consumed.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sink heater	90	42	1.50	—	—	—	—	—	—	90	42	1.50	0.28	1.78
Sink heater	90	42	1.50	40	28	0.77	—	—	—	130	70	2.27	0.28	2.55
Sink heater + bath heater	90	42	1.50	40	28	0.77	120	—	1.36	250	70	3.63	0.28	3.91
Sink heater + circulator for baths	90	42	1.50	40	28	0.77	120	51	1.94	250	121	4.24	0.28	4.41
Small multipoint	90	63	1.74	40	42	0.93	120	—	1.36	250	105	3.99	0.42	4.41
Large multipoint	90	84	1.98	40	56	1.10	120	—	1.36	250	140	4.44	0.42	4.86
Circulator (intermittent)	On for about 6 hours a day									250	85	4.1	1.9	6.0
Circulator (continuous)										250	85	4.1	3.5	7.6
Storage (intermittent)	On for about 2½ hours a day									250	40	3.4	1.3	4.7
Storage (continuous)										250	40	3.4	2.5	5.9

TABLE XI.—Average Gas Consumption (Therms per Week) Over 22 Summer Weeks to Obtain Standard Usage of 240 Gall. at 140°F. from Feed Water at 65°F. Average.

Installation.	Sink. Useful gall. at 140°F.	Sink. Wastage, gall.	Sink. Gas Consumed.	Basin. Useful gall. at 140°F.	Basin. Wastage, gall.	Basin. Gas Consumed.	Bath. Useful gall. at 140°F.	Bath. Wastage, gall.	Bath. Gas Consumed.	Total. Useful gall. at 140°F.	Total. Wast. age, gall.	Total. Gas to Heat total Water Drawn.	Total. Pilot or Stand-by.	Total. Total Gas Consumed.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sink heater	90	42	1.32	—	—	—	—	—	—	90	42	1.32	0.28	1.60
Sink heater	90	42	1.32	40	28	0.68	—	—	—	130	70	2.00	0.28	2.28
Sink heater + bath heater	90	42	1.32	40	28	0.68	110	—	1.10	240	70	3.10	0.28	3.38
Sink heater + circulator for baths	90	42	1.32	40	28	0.68	110	51	1.61	240	121	3.61	0.28	3.89
Small multipoint	90	63	1.53	40	42	0.82	110	—	1.10	240	105	3.45	0.42	3.87
Large multipoint	90	84	1.74	40	56	0.96	110	—	1.10	240	140	3.80	0.42	4.22
Circulator (intermittent)	On for about 6 hours a day									240	85	3.5	1.7	5.2
Circulator (continuous)										240	85	3.5	3.1	6.6
Storage (intermittent)	On for about 2½ hours a day									240	40	3.0	1.2	4.2
Storage (continuous)										240	40	3.0	2.2	5.2

	Weekly Consumptions.		Units Equivalent to a Therm.	
	Without Baths. (80 gall. at c. 140°F.)	With Baths. (150 gall. at c. 140°F.)	Without Baths.	With Baths.
Gas	1.75 therms	2.5 therms	—	—
Electric (continuous use)	73 units	84 units	42	34
Electric (intermittent) ...	47 „	59 „	27	24

The intermittent use of the immersion heater was investigated in order to find what would be the most economical use of electricity. As already mentioned, it gives a poorer service than the gas heater, no really hot water being available at either the beginning or the end of the day. Even the continuous use of the immersion heater gives a service inferior in some respects to that of the gas multipoint; baths cannot be obtained at intervals of less than 3 hours, so that it would seldom be convenient in practice to take more than one bath per evening. For the first hour or more after drawing a bath no hot water is available for any purpose. With the gas multipoint, on the other hand, baths can be and normally are taken in succession and hot water is available at sink and basin at all times, except while bath is actually being drawn. In the test four baths were run off on one day and two on another.

Nor does the intermittent use of the electric immersion heater compare with the intermittent use of gas storage heaters and circulators. These, with their high rate of make-up and good stratification, can give a fully adequate service when so used.

It will be seen therefore that with electricity the running costs for even passably good service may be prohibitive. It should be noted that the figures given were obtained with the thermostat set at 145°F., and that even higher consumptions would have been obtained at the more usual temperature for electric water heating of 160°F. Standby consumption alone at this temperature is 74 units a week. The higher cost of providing a gas water-heater in these houses would be offset by the lower capital cost of the gas cooker, refrigerator and wash boiler. An additional advantage is that the flue of the gas multipoint would greatly improve the ventilation of the kitchen; tests have shown that even under the least favourable wind conditions one extra air change per hour is obtained.

APPENDIX 4

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The Combined Production and Resources Board announces that a further conference of vital importance to the industries of Great Britain, the United States of America, and Canada, at which long-standing differences in Anglo-American engineering practice and standards of measurements which have impeded war production are to be discussed, will be held in Canada this autumn. A committee has drawn up an agenda covering unification of engineering standards, screw threads, pipe threads for use in aircraft and other fuel and gas lines, limits and fits which affect practice of most engineering firms, drafting practice on which depends intelligibility of drawings to engineers on both sides of the Atlantic, and the standardization of accuracy of engineers' measuring tools, such as micrometers, vernier callipers, and dial gauges, for all of which there are no standards in the United States of America or Canada, while there is a complete set of standards for them in the United Kingdom. The conference, which is expected to be attended by many experts, will last about four weeks.

Wartime Trends in the National Organization of the Gas Industry*

by JAMES JAMIESON, Edinburgh

This is the third occasion on which I have had the honour to be President of the Waverley Association, this time for the second year in succession, but it is only the second time I have addressed you in that capacity because last year our meeting had to be abandoned. In my first Address in 1929 I spoke, among other things, of the selection and analysis of coal, the quality and calorific value of gas, the quality of coke, complete gasification. To-day, 16 years later, all these subjects are still topical; some of them, like the quality of coal, painfully so. If I were to speak to you on these subjects to-day, I should repeat with modifications a good deal of what I said then, so I propose to deal with the national organization of the Industry, particularly as it has been developing during the war years.

It has been said that the Gas Industry is in a state of suspended animation while it awaits the report of the Heyworth Committee upon its future. There is, I suppose, an element of truth in the statement; we know, for instance, that it would be unwise to try to give practical effect to some of the proposals contained in the Post-War Planning Report of the British Gas Federation before the findings of the Heyworth Committee are made public. On the other hand, I do not think that there is any disposition on the part of responsible opinion in the Gas Industry to expect too much of the Committee, or to suppose that its report will create utopian monopolies for gas in certain spheres of fuel usage. We are entitled to expect that the Committee will recognize the importance of the coal carbonizing industries in the national economy, and to hope that it will accept and recommend the adoption of the major constructive proposals which the Gas Industry has made for its own better organization and development; at the same time, I am sure that those who are entrusted by us with the task of framing national policy believe that development will come about mainly through the exertions of the Industry itself in conditions which may well be more highly competitive than ever before.

If, therefore, progress at the centre is not so rapid as many might wish, that is not the result of any foolish belief that the Heyworth report will remove the need for any further exertion. Indeed, the accusation of lack of animation is less than a half truth, because already much has been achieved by the quite prodigious animation of those who, in spite of wartime preoccupations and much depleted staffs, have carried on the work of the national organizations.

[Mr. Jamieson then enumerated some of the more outstanding of achievements, referring to the Report of the British Gas Federation, the Gas Research Board, the Domestic Heat Services Committee, the Industrial Gas Centres, the Federation of Gas Coke Associations, the British Gas Council, the Gas Advisory Committee, the Gas Engineering Advisory Boards, and the Coke Directorate appointed by the Ministry of Fuel and Power for the purpose of ensuring the equitable distribution of coke during the period of acute shortage.]

He continued: I have enumerated certain steps which have been taken by the central bodies during the period of the war. The list is perhaps not exhaustive, but it is, I think, indicative of the shape of things to come. It gives the impression of a considered plan; that the Gas Industry, so far as its national organizations are concerned, knows pretty well just where it wants to go; that it is already beginning to go there, and that it will, perhaps at no very distant date, get there. Its arrival is, however, in my view dependent upon two things principally. Firstly, it depends upon a minimum—I might say a reduction—of political interference, both local and national, accompanied by a greater measure of central and regional control and guidance of the Industry *by the Industry*; and secondly, upon the active and wholehearted support of the regions and individual undertakings for the national plan, and in giving effect to the policies of the central body.

The realization of the first proviso is a matter over which we have only a limited control, because it will be determined ultimately by the votes of the masses. We can help, however, by giving our support to those political parties and organizations which can influence public opinion in favour of free enterprise with a measure of facilitative State control as against nationalization with a maximum of restrictive State control.

As regards the second, there is a great deal we can do. We are all, willy-nilly, very much dependent for our prosperity, maybe in some cases even for our very survival, upon the work of the national organizations. In spite of that, there are still undertakings which are not members of all the organizations; undertakings which must obviously derive much indirect benefit from their work, some even which, when in difficulties, ask for advice and assistance which are generally forthcoming without stint. Yet it seems only elementary common sense that a nation-wide industry must benefit greatly from the centralization of those activities which are too big for the individual undertaking to deal with adequately by itself, research and development, publicity, political and legal affairs, technical education and the like, apart altogether from the advantages to be derived from the pooling of the knowledge and the experience of the best brains in the industry. Every undertaking which is not already a member of the national bodies can therefore greatly assist the post-war plan by joining now.

And I do not think any of us should take a too niggardly view of the amount of our subscriptions. I am impressed by the amount of time and effort devoted by the willing few who serve on the central and regional committees, not to the framing of policy, which is their proper function, but to putting that policy into effect, which is not properly their function at all. By thus combining the functions of administrator and executive less is done, and it is not done so well as it might be. This is no reflection upon either the committees or the limited staffs at their disposal; rather it is a reflection upon the attitude of the whole Industry towards the financing of the central organizations. We have relied too much in the past upon the voluntary services of committee members who already have a full-time job on their hands in their own undertakings which they cannot afford to neglect for reasons that are in part obvious, but also for the reason in particular that these are the sources of the knowledge and experience which they can bring to the service of the Industry as a whole.

We should not now expect more than that bare minimum of voluntary service which is necessary for the determination of policy. For the executive services we should be prepared to employ permanent paid staffs with the proper qualities and qualifications. In that way we can hope to make progress at the rate that will be needed in the post-war period; we shall get more and better results from the work of the committees; and we shall have a better chance of securing for these committees the services of younger men who are so much needed in the counsels of the Industry, but who for the present cannot afford the time required by committee membership.

Again, the Industry in general can make a substantial contribution towards the realization of post-war plans by carrying out promptly the recommendations which come from the central bodies. I wonder whether we are doing all we can in that direction; whether perhaps the state of suspended animation exists not so much at headquarters, but in the districts; whether we are waiting to be spoon fed and directed instead of taking what action we can ourselves.

As far back as 1942, The Institution of Gas Engineers issued certain reports and recommendations, most of which could be acted upon by individual undertakings now. Among these was one relating to gas quality, in which it was stressed that the term "quality" covered adequate and consistent pressure. I confess I am perturbed to hear from time to time of business being lost to the Gas Industry, not on considerations of price, so much as on service and quality of gas supply. Such incidents react unfavourably upon the reputation of our Industry, and are not unconnected with the unjustifiably high prestige enjoyed by electricity in certain quarters.

The same series of reports included one relating to coke quality and the important part played by proper screening and sizing of the fuel. This has been well enough known for many years, but proper screening and sizing are by no means universal. Having regard to the close relationship between the value of coke and the price of gas, it behoves us to do all we can to turn our coke into a generally acceptable fuel.

More recently we have had impressed upon us by the Domestic Heat Advisory Centres the importance of local contacts and publicity. I am afraid that we still suffer from a marked insufficiency of this kind of activity.

In a number of undertakings, improvements are prevented by lack of financial resources. In such cases, the central organizations have long recommended local amalgamations or joint working. Little progress in this direction has been made except by holding companies, which again emphasizes the initiative of free enterprise as against public control. But public control will inevitably step in and compel the closing down or amalgamation of undertakings where the service is below standard, unless arrangements are made in the interval to forestall such intervention. Cases of intervention by the Ministry of Fuel and Power are already not unknown, and we must guard against the possibility of providing a breeding-ground for the protagonists of out-and-out State control.

Summarizing

I should summarize the situation of our Industry to-day as follows: The Gas Industry as represented by its central and regional bodies has a plan for its future organization and development. It is proceeding as far as circumstances will permit to put that plan into effect by laying now the foundations on which the plan will be built, without waiting for the verdict of the Heyworth Committee, though that verdict is bound to have a profound influence upon the achievement of the declared aims of the Industry as set out in the Post-War Planning report of the British Gas Federation.

We as engineers can assist in the fulfilment of the plan by doing all that lies in our power to improve our service to the public, and I believe that, broadly speaking, we are aware of that necessity and willing to work for better consumer service by technical improvements, amalgamations, mutual co-operation, and improvement in the status and qualifications of our personnel.

It is abundantly evident, however, that the forms and methods of ownership and control can make or mar the plan. It is profoundly to be hoped, therefore, that the Heyworth Committee will strongly recommend control of the Industry by the Industry through machinery which can compel efficient service where it does not already exist,

* From the Presidential Address to the Waverley Association, June 22.

irrespective of the interests or lack of interest of parochial or unenlightened ownershop. In this respect, the future of our Industry depends greatly upon the recommendations of this Committee of Enquiry, and upon the manner in which they are implemented.

I think I can conclude, therefore, by saying that given a reasonable measure of freedom we shall create an effective national organization and go forward to the future with complete confidence, fired with a determination to develop to the full and in the public interest the immense possibilities of the process of coal carbonization.

DISCUSSION

Mr. **John Richmond** (Magherafelt) said the Address was comprehensive but the Author was inconsistent. He had lauded the Ministry of Fuel and Power, an indefinite body employing thousands of well paid Government servants and a body which had done little good. At the same time Mr. Jamieson had applauded the policy of non-interference by the Government.

Mr. **R. Fife** (Kilmarnock) said the political questions affecting the future of the Industry lay with the masses. Gas had maintained its prestige during the past five years.

Mr. **E. Shiell** (Innerleithen) said Mr. Jamieson had suggested that the Heyworth Committee should recommend control of the Industry through machinery which could compel efficient service. They all knew obvious cases for amalgamation, but how was the Industry to compel recalcitrant directors or shareholders to amalgamate at stated prices for their shares? Compulsion would cut across every known law in the country regarding private ownership. He could see how a recommendation might be made to a Government Department.

Mr. **Jamieson,** in reply, said they had no desire to compel, but would prefer to take people with them. But if compulsion were necessary it would come from the Ministry of Fuel and Power acting on the advice of a national body.

Mr. **D. Fulton** (Helensburgh) said they expected the Report of the Heyworth Committee by the end of the year, and he was sure that what was announced recently for the coal trade would be the same for their Industry—namely, a controlling body. All their proposals regarding amalgamation, installation of new plant, and the general conduct of the Industry would require to have reference to that body. Compulsion could only be effected by a body external to the Industry, and that would be set up in the form of a Central Tribunal—a Gas Commission. He could not see any reconciliation between the views of those who favoured nationalization, those who wished municipalization only, and those who believed in private ownership. They would fail ignominiously if they did not get away from the purely local point of view, and see gas as an industry and not from the confines of a town or city. Mr. Fulton said he had long been a wholehearted believer in total gasification. He could not see the Industry doing well as a two-fuel one. It was a Gas Industry, and if they did not find a way in which coal could be totally gasified they would go back. He expressed the hope that Advisory Boards would continue in peacetime, and would do even better work in the future. Undertakings generally had been ready to adopt suggestions. Looking at the matter broadly, they suffered because so many of their undertakings were small, and could not afford the means to combat the great resources of their competitor, electricity. In the Clyde Valley area they were suffering from the shock attack of the Clyde Valley Power Company. Working independently they would get a setback, but if they worked together they could defend their position successfully.

Mr. **James Bell** (formerly of Dumbarton) said he had been greatly impressed by the progress made by the Association since he had severed his close connexion with it. He also believed in total gasification. But till a simple and economic process of complete gasification was evolved coke would be produced, and their job was to make first-grade smokeless fuel. New houses were being supplied with solid fuel appliances. Smokeless fuel gave excellent results in the domestic field. Mr. Bell said he did not believe they would be overwhelmed by their competitor, electricity.

Mr. **R. Cowie** (Hawick) said their President had done more than his share of voluntary work for the Industry.

The Physical and Chemical Reactions of Carbonization*

By THOS. BIDDULPH-SMITH, F.R.I.C., A.M.Inst.Gas E.

DURING recent years much attention has been paid by all branches of the carbonizing industry to the chemical and physical characteristics of coal, but generally the information of practical importance obtained amounts only to the knowledge that certain coals blended in proportions ascertained by experiment give, when carbonized, the most suitable results for the desired purpose.

The chemical composition and structure of the coal conglomerate remain an unsolved problem, although all the vast resources of modern science have been brought to bear upon its solution. We only know coal is a complex mass of hydrocarbons, and that its composition varies from seam to seam and from district to district according to its age and the conditions under which it has existed during the period of its formation.

We also know that during its formation, as it passed through the various stages from lignite and cannel to bituminous coal, its progression has been accompanied by a gradual change in the carbon-hydrogen ratio, the latter being reduced supposedly by direct oxidation or similar but more complex reactions, until finally our bituminous coal of to-day is a mass of unsaturated hydrocarbons of unknown chemical structure.

Carbonization of this material breaks it down to yield gaseous, liquid, and solid products of less complexity, and we have accepted this process as being reasonably economical, devoting our efforts to blending coals to improve the yield and quality of those products most particularly desired.

Except for varying the temperature and speed of carbonization, the designing of carbonizing chambers for the purpose of attaining greater thermal efficiency in the application of the necessary heat, and the addition of steam to combine with the carbon and form water gas, carbonization to-day is the same in general principle as it was 100 years ago.

The Author has long been of the opinion that carbonization as generally practised is most unscientific in its principles, and a disgraceful waste of perhaps the greatest and most valuable of our natural resources, and in order to focus attention in this direction he proposes to place before you a general *résumé* of the known facts relating to carbonization, together with a theory he has developed and largely verified by experiment to explain the chemical and physical reactions which occur.

As normal caking bituminous coal is heated and passes through a certain temperature range, varying for different coals, but generally in the region of 300°–400°C., it becomes plastic, due to the breaking down of its chemical structure and the formation of hydrocarbons, still highly unsaturated, but of lower molecular weight, and mostly liquid at that temperature, which process is accompanied by the deposition of carbon and hydrocarbons of high carbon content, solid at that temperature.

These hydrocarbon oils, which can be extracted by condensing the vapours drawn from the plastic layer, are very reactive; in fact, when exposed to the air on a balance pan, increase in weight, due to oxidation, is seen to take place with great rapidity. The Author[1] has shown that,

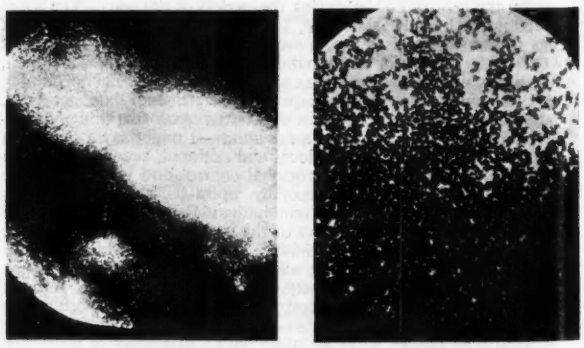

FIG. 1A. FIG. 1B (increased magnification).

Showing particles of solidified carbonaceous material suspended in the oil streams of the plastic layer.

when freshly extracted and examined under a microscope, they are seen to be of a light yellow colour, but are loaded with a heavy suspension of solid particles of carbon or hydrocarbons approaching pure carbon, as shown in the micrograph, fig. 1.

The effect of still higher temperatures on this oil-carbon mixture as carbonization proceeds is two-fold. Not only are the reactive hydrocarbons further broken down, depositing more and more carbon, but the higher temperatures volatilize the lighter oils produced, thus rapidly increasing the free carbon content, so that with further increase of heat the oil-carbon sludge rapidly thickens to a semi-solid mass, from which hydrocarbon vapours are streaming, and finally at temperatures about 400°–450°C. solidifies in a sponge-like mass which the Author calls the primary coke structure[2]—see fig. 2.

* Paper to the Manchester and District Junior Gas Assoication, June 2.

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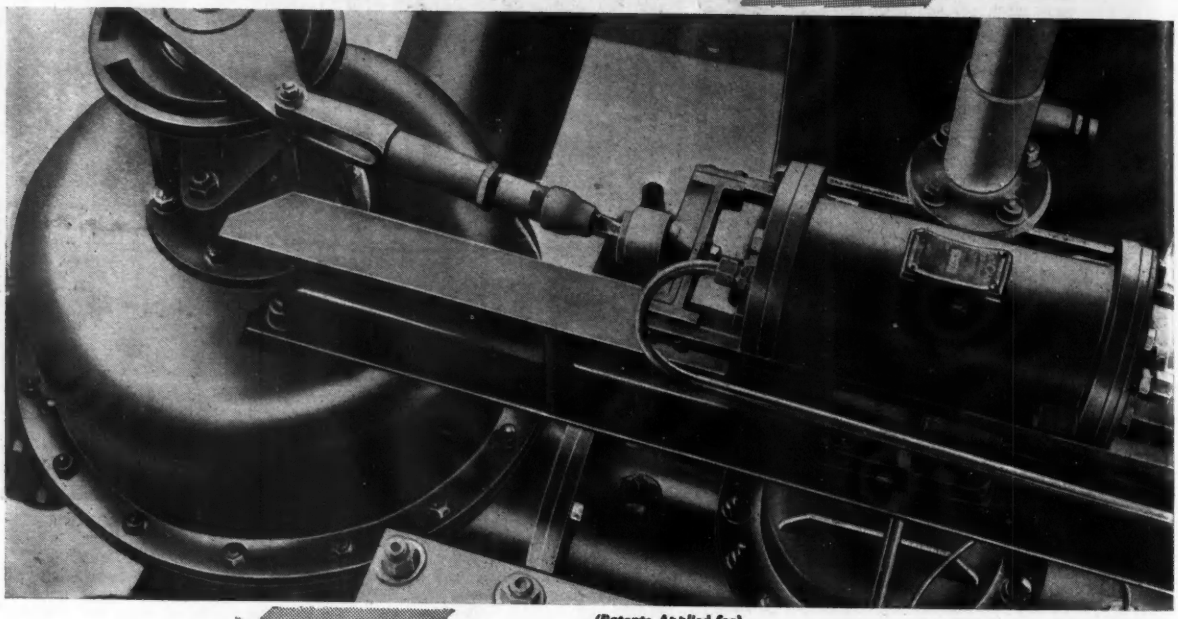

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During this process the evolved products consist mainly of hydrocarbons, the residual gas, after extraction of the condensible oils, having the following analysis:

CO_2	13.2%
O_2	1.8%
CO	5.0%
CnH_2n	3.6%
C_2H_6	36.1%
CH_4	32.0%
H_2	8.0%
N_2	0.3%

The oil vapours drawn from the plastic layer and condensed which have been examined by the Author had generally a carbon-hydrogen ratio of 9.6 : 1.0, which demonstrates their degree of unsaturation, and explains why there is so little free hydrogen evolved at this stage.

FIG. 2.—*Showing solidified porous mass of carbon and hydrocarbons forming the primary structure of coke.*

The carbon-hydrogen ratio of bituminous coals examined by the Author have been generally in the region of 15.5 : 1, so that the reduction to 9.6 : 1.0 in the liquid products is balanced by the amount of carbon or near-carbon forming the "primary-coke."

There is a considerable amount of hydrocarbon substance still in the primary-coke, which is evolved at higher temperatures, but before considering its evolution and what occurs to the hydrocarbons evolved during the plasticity stage it will be advisable first to examine the physical conditions which exist in an ordinary static carbonization chamber.

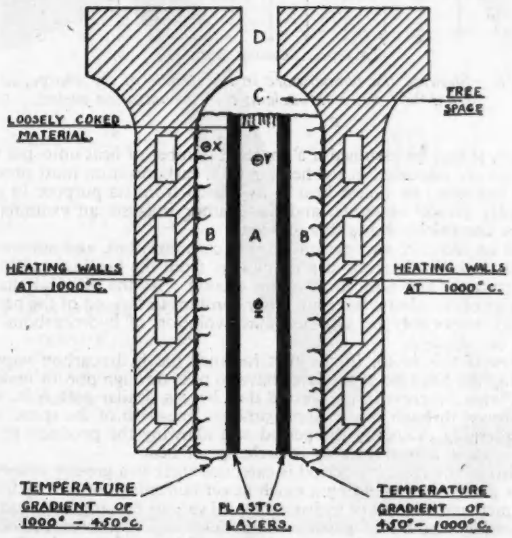

FIG. 3.

Fig. 3 illustrates those of major importance. It must be visualized that the plastic layer is travelling into the charge as carbonization proceeds and the honeycombed set material is immediately behind it—*i.e.*, between the heating wall and the plastic layer, shown marked "B," fig. 3.

Foxwell[3] has shown the plastic layer is generally impermeable to the passage of gases and vapours, and with this the Author agrees, providing the layer is not able to expand freely, so that any such products evolved on either side of the resistance mid-line of the plastic layer (fig. 4) must remain on that side until they finally arrive at the free space above the charge.

If we assume, for the sake of example, the resistance mid-line of the plastic layer to be at a temperature of 350°C., then all products evolved above this temperature must pass up through the solidified but porous mass of primary coke in zone "B," whilst those evolved below this temperature must pass through the as yet uncarbonized coal in zone "A."

Bearing these physical conditions in mind we can now return to the reactions of carbonization. The temperature range of plasticity of coals varies, but in all the cases observed by the Author, by far the greater amount of volatile products are evolved above the temperature of the resistance mid-line.

These highly unsaturated and chemically reactive products, produced at temperatures in the vicinity of 350°–450°C. and therefore in

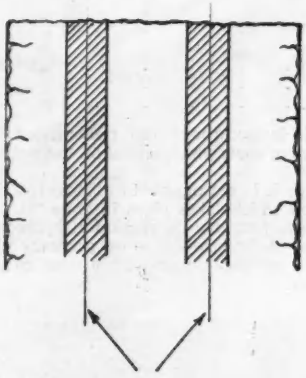

FIG. 4.

equilibrium with the conditions existing at those temperatures, must pass in extremely fine streams through the pores of the primary coke which has attained a temperature gradient of 450°–1,000°C.—*i.e.*, from that of the setting side of the plastic layer to that of the heating wall.

In so doing they largely become decomposed to hydrogen, methane, oxides of carbon according to the amount of oxygen present in the original coal, and carbon, the latter being deposited in the pores and over all the exposed surfaces, thus converting the soft primary coke to the well known, hard, and so-called "high temperature" coke of commerce, so suitable for metallurgical purposes, but very unsuitable for the ordinary domestic fire, because of the low combustibility of this carbon plating.

Fig. 12 shows two pieces of coke carbonized from the same coal (Durham) at the same temperature. In the one case the primary coke has been "filled" with deposition carbon, while in the other this action has been prevented.

At this point it would be advisable to describe two experiments carried out by the Author and which give confirmation to the above reasoning.

(A) A sample of oil was drawn from the plastic layer, filtered and distilled, the vapours being led through a silica tube filled with broken primary coke and heated to 600°C. Here they were partly decomposed to hydrogen and methane with much smaller amounts of ethane and members of the ethylene series, whilst carbon was deposited on the coke. When the experiment was repeated using a temperature of 1,000°C. the amount of hydrogen was increased and the methane decreased, members of the ethylene series were considerably reduced and ethane completely disappeared.

The permanent gases obtained after being freed from tarry matter and condensible light oils are shown below:

	600° C. %	1,000° C. %
CO_2	6.3	2.4
O_2	0.5	0.9
CO	5.4	8.6
CnH_2n	5.0	3.5
C_2H_6	5.2	*Nil*
CH_4	44.0	25.6
H_2	29.0	54.8
N_2	4.6	4.2

Varying the speed of passing the vapours through the reaction tube made less difference to the composition of the permanent gases than was expected, but proportionately varied the amounts of undecomposed condensible products, suggesting that temperature is the main factor.

It was found impossible to obtain the same surface area in any two experiments because of the irregularity of the free space between the small pieces of coke, so that the Author appreciates these experiments leave much to be desired from the point of experimental technique. Also it was not found possible to obtain the conditions existing in a practical retort where the hydrocarbons are not passing through broken material, but must pass through the pores of the mass in fine streams. These experiments do show, however, that by decomposition of the hydrocarbon oils evolved from the plastic layer, permanent gaseous mixtures similar to what we know as low temperature and high temperature coal gas can be produced.

(B) Samples of gas were drawn from a pipe "X" in fig. 3 after the plastic layer had passed that point—*i.e.*, in the path of the stream of gases which have passed through the decomposition zone "B," the following being their analysis:

CO_2	2.0%
O_2	0.8%
CO	12.4%
CnH_2n	0.5%
H_2	60.8%
CH_4	12.2%
N_2	11.3%

No condensible hydrocarbons were present, but the gases carried entrained particles of soot, which settled on the walls of the sampling tube.

From the above it is reasonable to assume that it is during this secondary reaction which takes place in zone "B," fig. 3, that coal gas is first produced from the destruction of hydrocarbons, although the calorific value is far below that we generally obtain from coal carbonization, and obviously must receive some enrichment before it leaves the chamber.

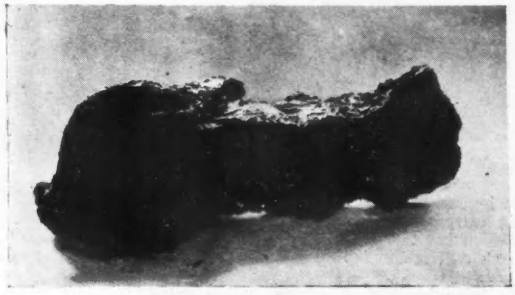

FIG. 5.—*"Beta" sponge from top of charge.*

While passing in fine streams through the hot primary coke, these cracked permanent gases are proportionately heated and arrive at the free space above the charge at a very high temperature—the maximum being that of the heating wall—thus heating the crown of the chamber, which in turn by radiation carbonizes the top layer of the charge.

The carbonization of this loose coal having no compression as exists lower down in the charge by the weight of the coal above it produces a layer of frothed-up coke mass as shown in fig. 5, and which the Author calls "Beta" sponge to distinguish it from "Alpha" sponge, which will be described later.

So far we have dealt with the products evolved above 350°C., which we took as the supposed temperature of the resistance mid-line of the plastic layer. Below this temperature both hydrocarbons and water vapour are evolved, and these must pass up through the as yet uncarbonized coal zone, "A," fig. 3, which later quickly attains a temperature of 100°C., in the vicinity of which it remains until near the end of the carbonization period—see graph, fig. 6.

Samples of gaseous products withdrawn at the point "Y," fig. 3, are found to be heavily laden with oil and water vapours, which can easily be condensed.

During their passage through this zone the hydrocarbons are carried by steam distillation, the steam being derived from water present in the coal, and most of the lighter boiling fractions pass directly at little above 100°C. upwards and through the already described "Beta" sponge, whence they merge into the atmosphere of low grade gas at a temperature approaching 800–1,000°C., which has arrived *via* the hot side of the plastic barrier.

The sudden elevation of temperature these products there obtain, bearing in mind they are unsaturated and highly reactive, causes immediate cracking to commence, but as the time for reaction is so short this is generally limited to the production of aromatic hydrocarbons, methane and members of the ethylene series together with some hydrogen and oxide of carbon. The carbon precipitated as a result of this reaction is deposited on the crown of the chamber as retort carbon, and as soot in the "offtake" and in the tar which is later extracted from the cooled gas, producing some of the well-known free carbon of tar.

Experienced operators will tell you one of the golden rules of carbonization is to fill the retort as full as possible with a coal sized to give the maximum bulk density, so as to keep the cross-sectional area of the free space down to the minimum, since it has long been known that by so doing less trouble is experienced with roof carbon, dirty offtakes and free carbon in tar, also better yields of condensible hydrocarbons are obtained.

It will be seen that by keeping a low cross-sectional area of the free space, a high outlet velocity of the gases arriving there will be obtained, and cracking, which would otherwise proceed to an excessive extent, is therefore restricted.

The lean gases produced on the hot side of the plastic layer are therefore enriched to the normal value of coal gas by the less decomposed inner zone gases, which later also provide the condensible hydrocarbons we are accustomed to recovering.

This theory of carbonization explains many of the phenomena to which we have become accustomed, but often without fully understanding their cause.

(*a*) It will be now understood why higher temperatures yield a greater volume of gas of lower calorific value, since the higher temperature increases the extent of the cracking, producing more hydrogen, since by splitting a molecule of hydrocarbon many times its own volume of hydrogen may be produced. This is, of course, in addition to the simple possibility that all the volatile constituent may not have been volatilized at the lower temperatures.

(*b*) It is well known that carbonization proceeds progressively slower as it penetrates deeper into the charge. Coal in a chamber 16 in. wide may be carbonized in 12 hours, yet while using the same temperature an 18 in. wide chamber will require 18 hours, and a 20 in. chamber 24 hours.

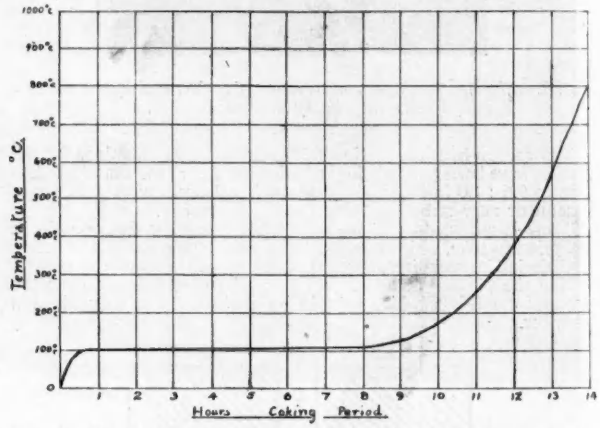

FIG. 6.—*Showing the temperature in the middle of the charge, at the period "Z" fig. 3 throughout the carbonization period.*

Now it may be assumed if a constant number of heat units per unit of time are presented at the heating wall, carbonization must proceed at a uniform rate unless heat is by-passed from its purpose in consistently greater amounts, and the Author suggests an examination of the conditions shows this to occur.

Let us compare two periods during carbonization, and assume the plastic layer has arrived at a point 1 in. from the heating wall in the first instance and 6 in. away in the second. As the physical characteristics of the plastic layer are fairly constant to the end of the period, it may reasonably be assumed that evolution of hydrocarbons will also be constant.

Now if this is so, in the first instance the hydrocarbon vapours leaving the hot side of the layer have to pass through porous material 1 in. wide, whereas in the second they have a similar path 6 in. wide and travel through this at approximately one-sixth of the speed, thus considerably extending the period and allowing the products to rise to a greater temperature by interchange of heat.

Also as the cracking period is extended there is a greater volume of gases produced containing a much larger percentage of free hydrogen and methane per unit of hydrocarbon oil vapour decomposed, and this increasing amount of gases also carries away to the crown of the chamber progressively greater amounts of heat. It may be thought that a molecule of hydrocarbon vapour will have the same specific heat as the sum of a number of molecules of substance of lower molecular weight into which it has been cracked, but this is not so if we are to accept the published results of specific heat determination.(4) Thus more and more sensible heat is by-passed from its intended purpose and the carbonization process is proportionately slowed down. The graph, fig. 7, showing the rising temperature of gases leaving the chamber during carbonization plainly demonstrates this gradual but consistent increase in loss of heat.

(*c*) The gradual increase of the hydrogen content of coal gas, accompanied by a corresponding reduction of methane and ethylene

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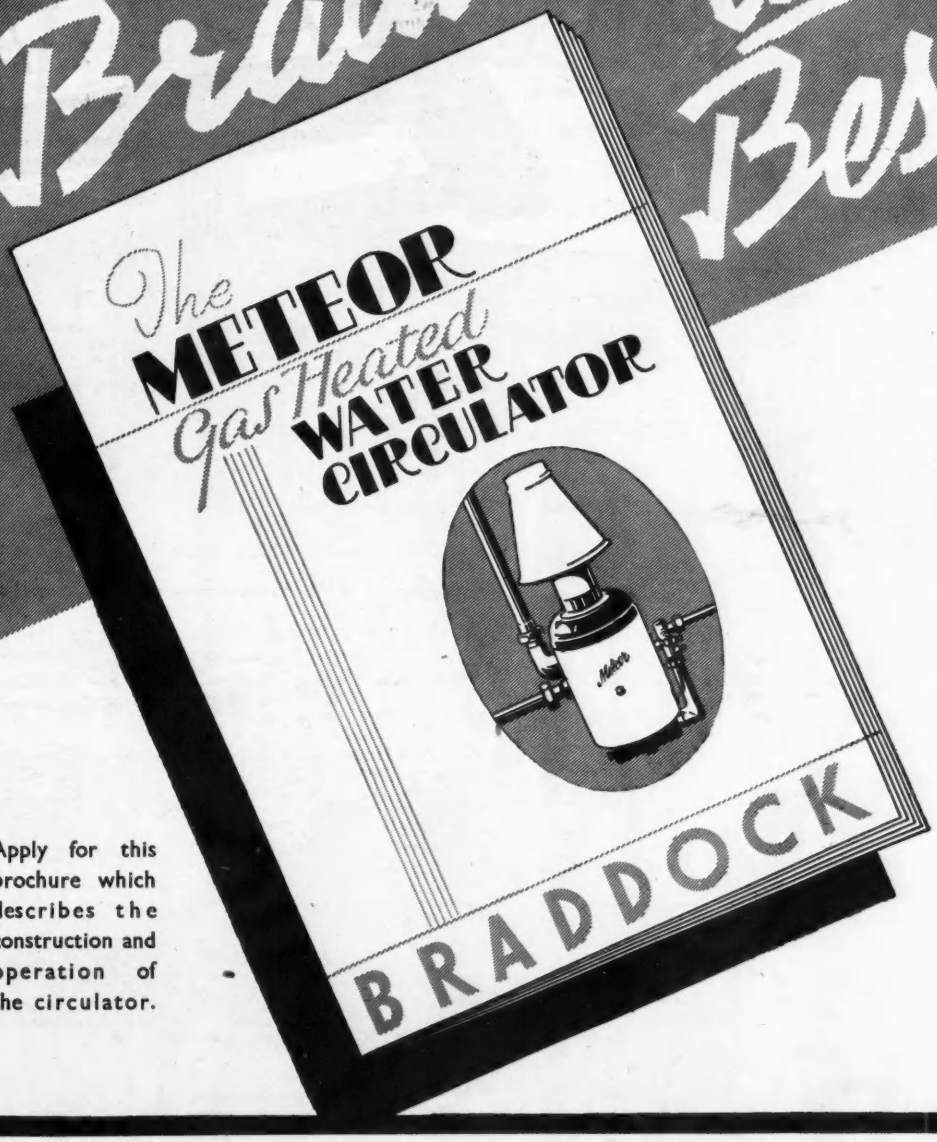

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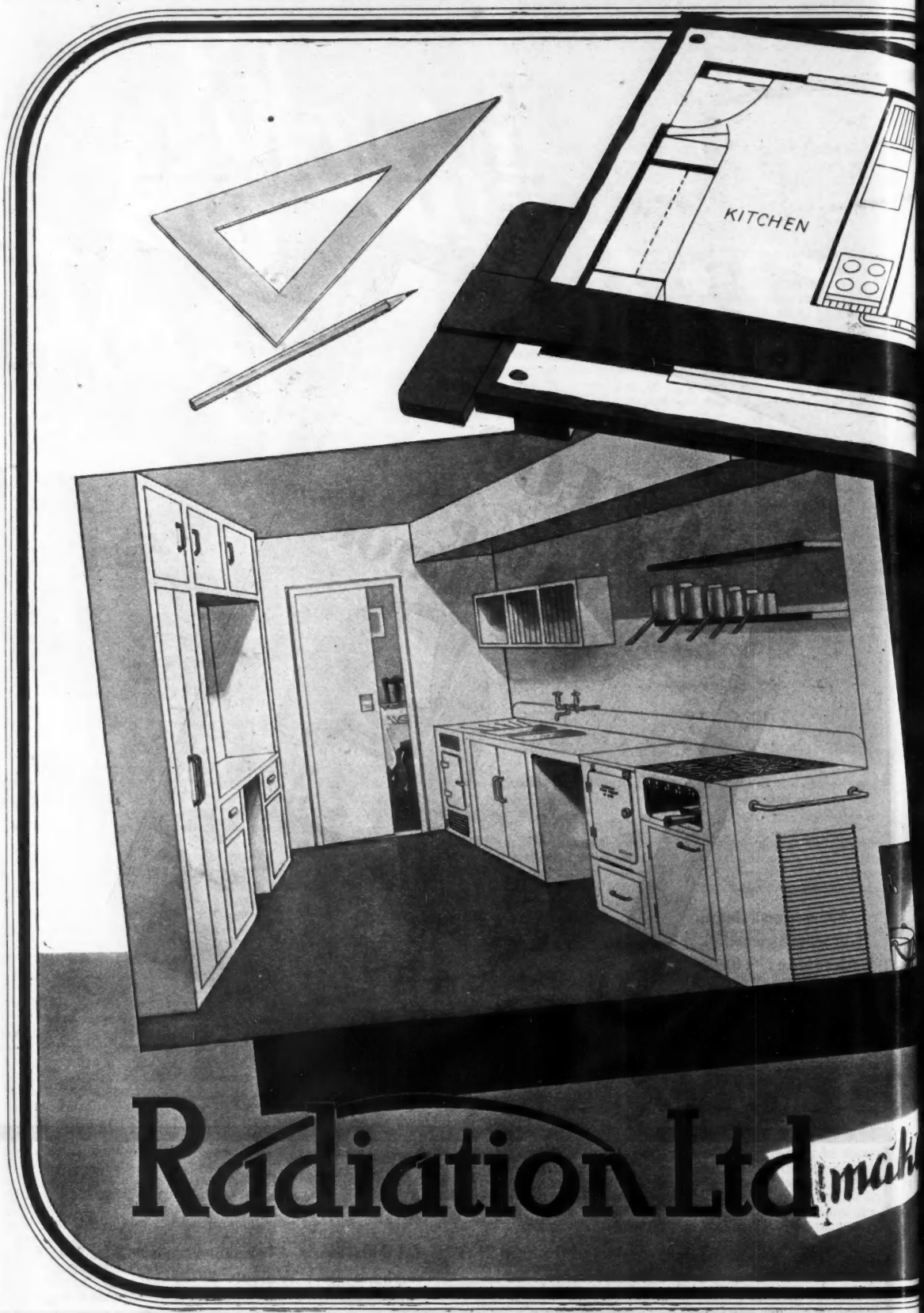
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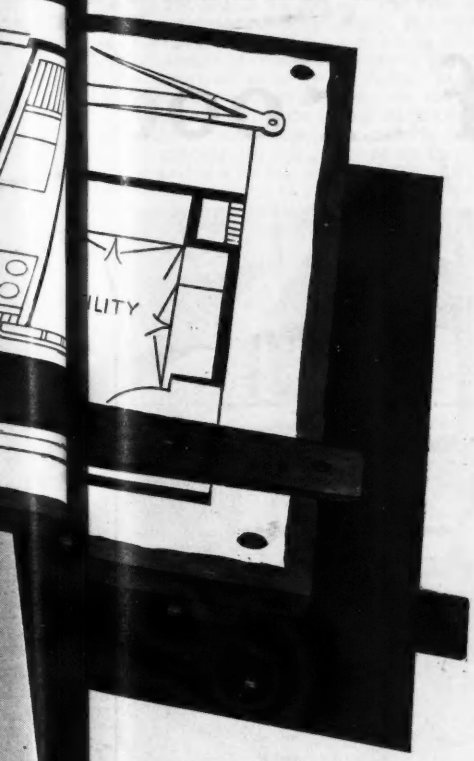

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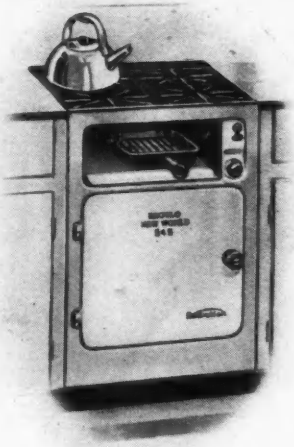

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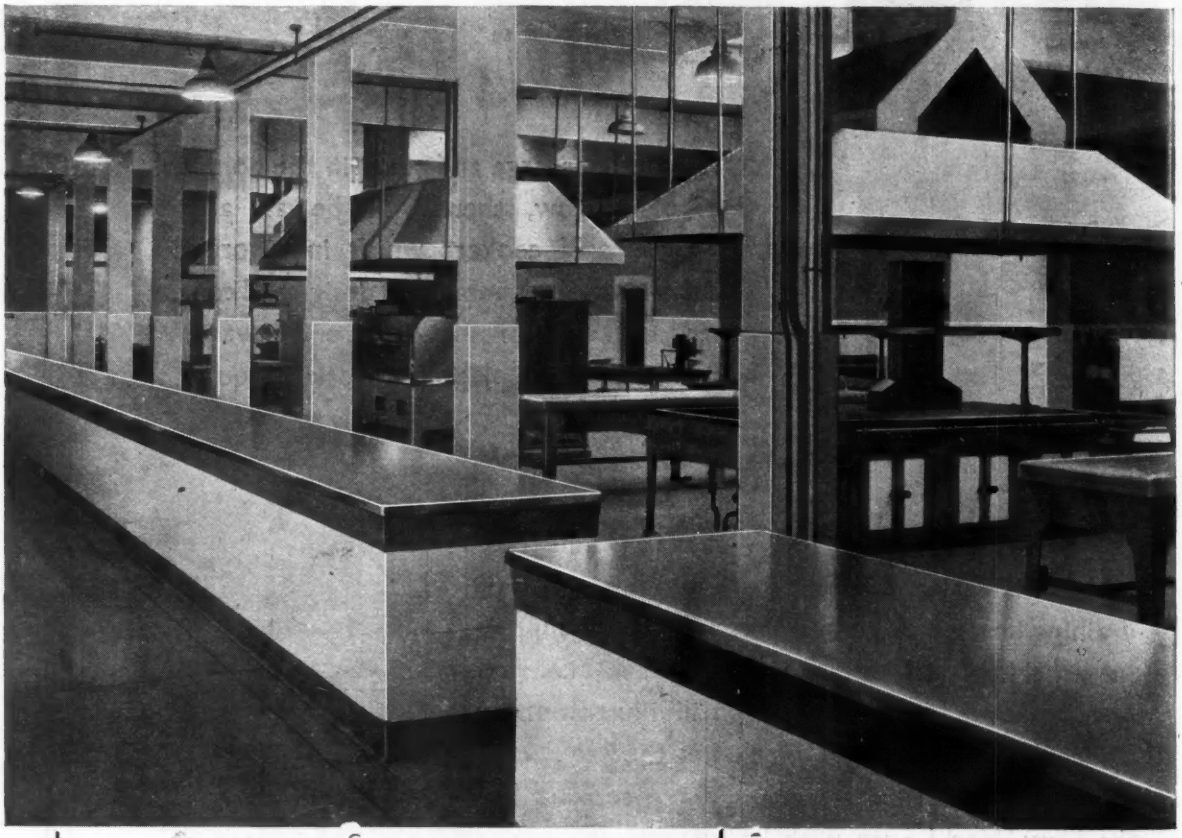

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as carbonization proceeds, is also explained by the theory the Author has advanced.

Fig. 8 shows the analysis of samples of gas taken at regular periods throughout the carbonization period, and enabled the Author(4) first to demonstrate an unexpected considerable enrichment of the gas towards the end of the period. The hydrogen content was reduced while the methane content increased, thus resulting in a rise of calorific value. The results were confirmed by a number of co-workers using different coals and chambers of varying dimensions.

The theory advanced by the Author to explain this phenomenon is that as carbonization proceeds, and the bulk of the free water has been evaporated from the uncarbonized coal between the two plastic layers, there is not enough left to carry by steam distillation the hydrocarbon vapours still being evolved on that side of the plastic layer, so that having a boiling range of 100°C.–360°C. (see fig. 9), they condense in the coal still at a temperature below their boiling point, and finally boil off as the plastic layers converge and the temperature there rapidly rises, producing during that period a greatly increased output of hydrocarbons.

The Author(2) suggests also that this final boil-up is responsible for "Alpha" sponge (fig. 10), which is so often found in the form of a wedge extending down the middle of the coked charge.

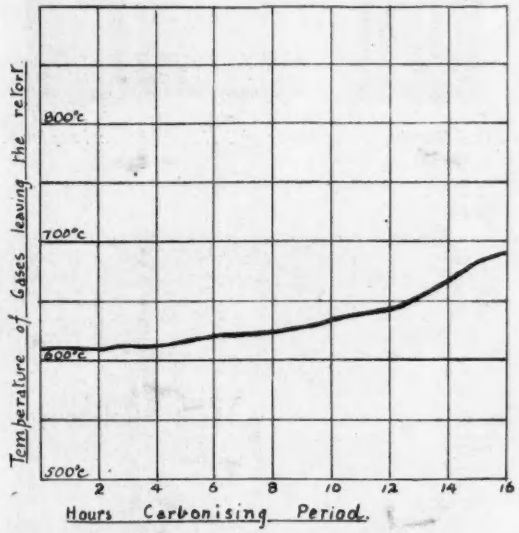


FIG. 7.—*Showing rise in temperature of gaseous products leaving the chamber.*

The Economic Aspect

If the foregoing theory of carbonization is accepted, consideration of the economic aspect presents an alarming picture. The Author has demonstrated by many experiments the primary reaction is the production of carbon, together with solid, liquid, and gaseous hydrocarbons, but with very little free hydrogen—in fact hardly any permanent gases are evolved at this stage. Now the hydrocarbon oils have a carbon-hydrogen ratio of 9.6 : 1.0, so that all hydrogen ultimately obtained, either in the free state or combined with carbon as methane, has been produced by the destruction of 10.6 times its weight of hydrocarbon oils.

When carbonizing coal normally, according to the quality of the coal and temperature used, approximately 11,000 cu.ft. of coal gas are evolved per ton of coal, containing usually about 52% of hydrogen and 30% of methane, so that the total weight of hydrogen in these two gases amounts to 72 lb. per ton of coal, and this from the above calculation has been produced by the destruction of $72 \times 10.6 = 763.2$ lb. of hydrocarbon oils.

As the specific gravity of the oils is round about 1.0, 76.3 gall. of this is destroyed per ton of coal to produce 11,000 cu.ft. of coal gas—a terrible indictment against the scientific world of to-day.

If this assumption is correct, should carbonization be controlled so as to eliminate completely these secondary reactions, then a yield of oils could be expected of 82.2 gall. per ton of coal carbonized, since with present-day conditions we recover an average of 6.0 gall. of condensible oils in addition to 11,000 cu.ft. of gas.

Low Temperature Carbonization

When carbonizing bituminous coal at much lower temperatures, say about 600°C., less of those destructive reactions take place, since the primary coke between the heating wall and the plastic layer is proportionately at a much lower temperature. Less carbon is deposited on the primary coke structure, and a much smaller yield of gas is obtained, generally of the following composition shown compared with normal high temperature gas.

	Low temperature.	High temperature.
CO_2	4.0%	2.4%
O_2	0.5%	0.4%
CO	4.0%	7.8%
CnH_2n	5.5%	3.4%
CH_4	46.8%	30.0%
C_2H_6	5.2%	*Nil*
H_2	30.0%	51.9%
N_2	4.0%	4.1%

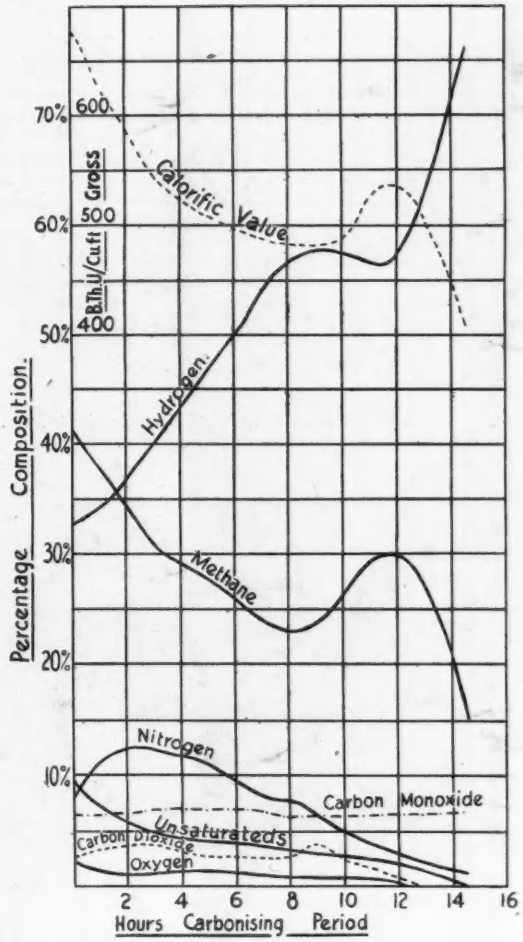


FIG. 8.—*Showing analysis of gases evolved throughout the carbonization period.*

The condensible oils or tars are composed largely of unsaturated substances and contain little free carbon—in fact they are similar in character to the oils of the plastic layer.

This difference in results obtained by high and low temperature carbonization should be understandable; in fact the Author claims those obtained when using temperatures below 600°C. verify the accuracy of the theory of carbonization as outlined above.

Although this use of low temperature is shown to be less destructive to the theoretically possible products of the distillation of coal, the advantage is more than outweighed by the following disadvantages:

(*a*) The solid residue may contain up to 10% of volatile hydrocarbons, which may represent 30% of that present in the coal.

(*b*) The low temperatures used slow down the speed of carbonization to a very uneconomical extent, involving the use of narrow retorts, metal conductors, etc.

Note.—The loss of heat by-passed to the crown of the oven, as explained above, is important in this respect.

(*c*) In the later stages of high temperature carbonization there is a considerable shrinkage of the charge, which enables it to be removed easily from the retort; but this is not attained when using low temperatures, so that discharge of the retort is rendered exceedingly difficult.

(*d*) The incompletely carbonized fuel is very friable, producing a large amount of breeze, and in comparison with high temperature coke very difficult to quench on discharge.

Many ingenious methods have been adopted to overcome these major difficulties, but so far they have generally brought with them others as troublesome and uneconomical as the original ones.

Some low temperature processes are being successfully operated, particularly where high prices are obtainable for the residual fuel, but while this is a step in the right direction, we cannot accept it as an answer to the problem of scientific carbonization.

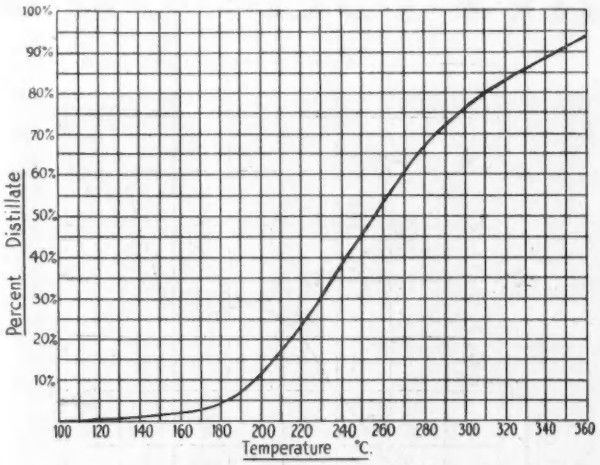


FIG. 9.—*Showing distillation curve of oils from the plastic layer.*

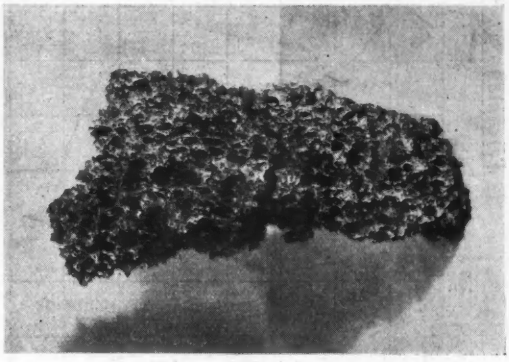


FIG. 10.—*Sample of "Alpha" sponge from middle of charge.*

The Internal Suction Oven

In 1926 the Author[1] published a Paper on the extraction and examination of oils from the centre of a carbonizing charge, and shortly afterwards Carl Still applied its principles to practice in his internal suction oven.

This process consists of inserting a series of tubes vertically into the middle of the charge, as shown in fig. 11, and to these is applied a high suction which draws away most of the "inner passage" hydrocarbons, so that they do not suffer the decomposition which in normal coking practice takes place as described above in the free space under the crown of the chamber. The mechanical difficulties of such a process, entailing extra manipulation, and also independent exhausting, condensing and collecting plants, since the outer passage gases still leave by the normal outlet, can be visualized, yet many plants were built in Germany and the results were claimed to be very satisfactory.

For this process the following claims were made and largely substantiated:

(*a*) Reduction of carbonization time by 10%–15%.

(*b*) Saving of thermal efficiency of 10%–12%. (*Note.*—This being due to "inner" gases leaving at 100°C.)

(*c*) Condensible oils increased by 12%.

(*d*) Reduction of swelling pressure of coals used.

These are considerable claims for the protection of only the small amount of "inner passage" hydrocarbon vapours, the much larger amount evolved on the hot side of the plastic layer being still practically decomposed.

What is the Ideal Method?

After considering all the points enumerated above, it will be obvious that the requirements for the carbonization of bituminous coal to produce the most reactive coke and the maximum possible yield of condensible hydrocarbons are:

1. The rendering permeable to gas passage of the plastic layer.
2. The passage of volatile hydrocarbons, as evolved, through zones of progressively lower temperatures to the point of egress from the carbonizing chamber—*i.e.*, directly away from the source of heat.

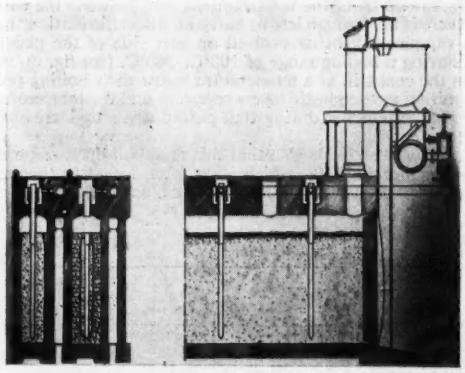


FIG. 11.—*Showing arrangements of Carl Still's internal suction oven.*

Coke produced at 1000°C by the normal method of Carbonisation.
B
A
Open, free burning coke from the same coal as 'B' produced at the same temperature by the B·S process

FIG. 12.—*Showing two samples of coke from the same coal and carbonized at the same high temperature* (1,000°C.). *"B" normal coke; "A" coke which has not been filled with deposition carbon.*

3. The use of similar high temperatures to those of normal coking practice, and complete carbonization at those temperatures in order to obtain a reasonable shrinkage.

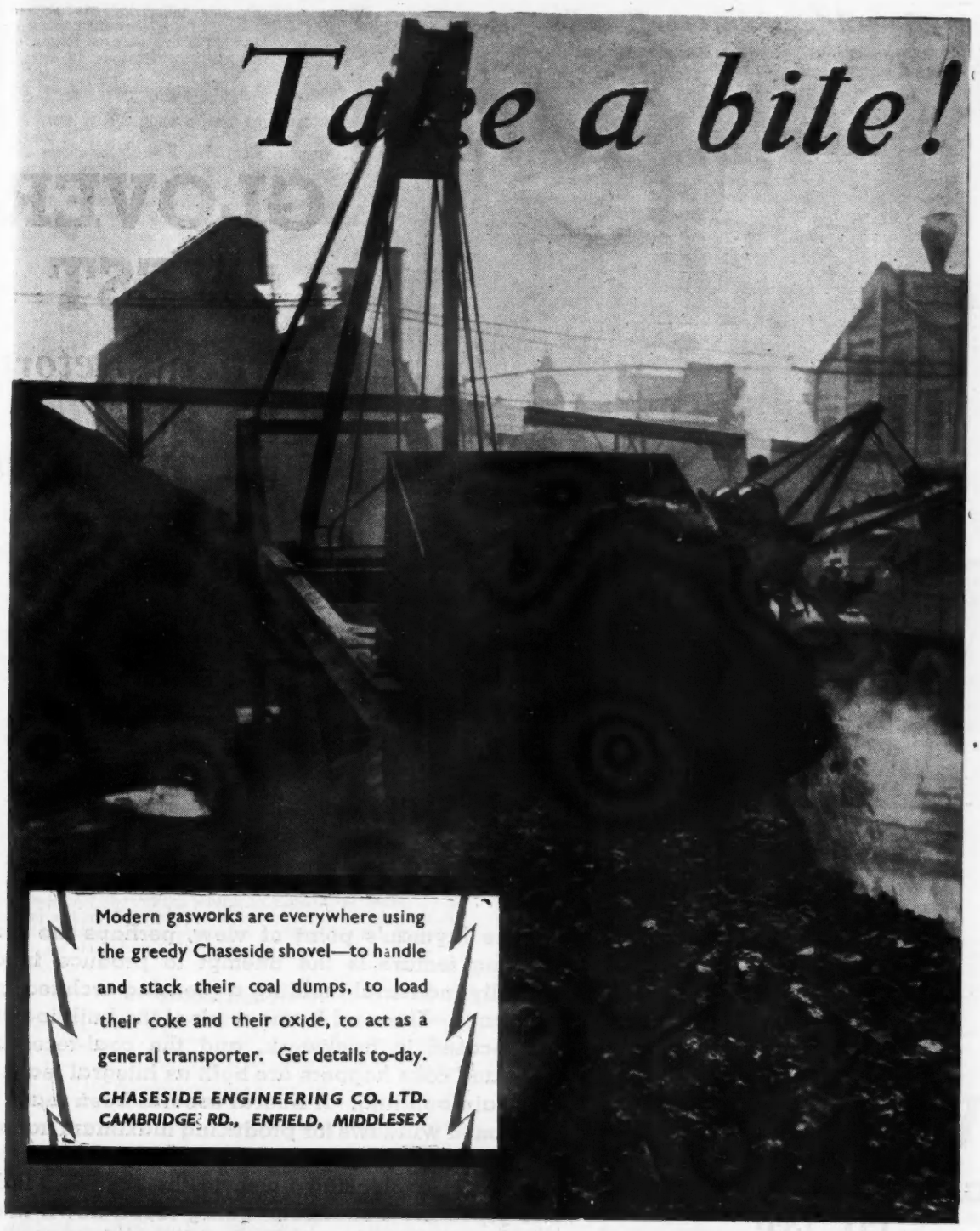
4. The use of steam, particularly in the latter stages of carbonization, when the normal moisture content has been evaporated, to carry away the remaining hydrocarbon vapours by steam distillation.

One process designed to fulfil the above requirements has already been invented, and on a small experimental scale results have been obtained which confirm the possible yields described above, but for security reasons it has been placed on the "Secret" list and details cannot yet be divulged.

The amount of condensible oils obtained even on this small scale, while not equal to the theoretical yield of over 80 gall. per ton of coal, were double those known to have been obtained by any other process, and were accompanied by a yield of about 3,000 cu.ft. of gas of 700–800 B.Th.U. per cu.ft., demonstrating that some of the oils had been cracked.

The practical development of such processes rarely approaches theoretical results, but in this instance the worst possible results which can be obtained are those of present practice.

Fig. 13 shows a hypothetical graph in which the two points, (1) normal carbonization results and (2) the theoretically possible ones, are connected, and it is suggested the practical results will fall somewhere along this curve, the yield of gas falling and the yield of



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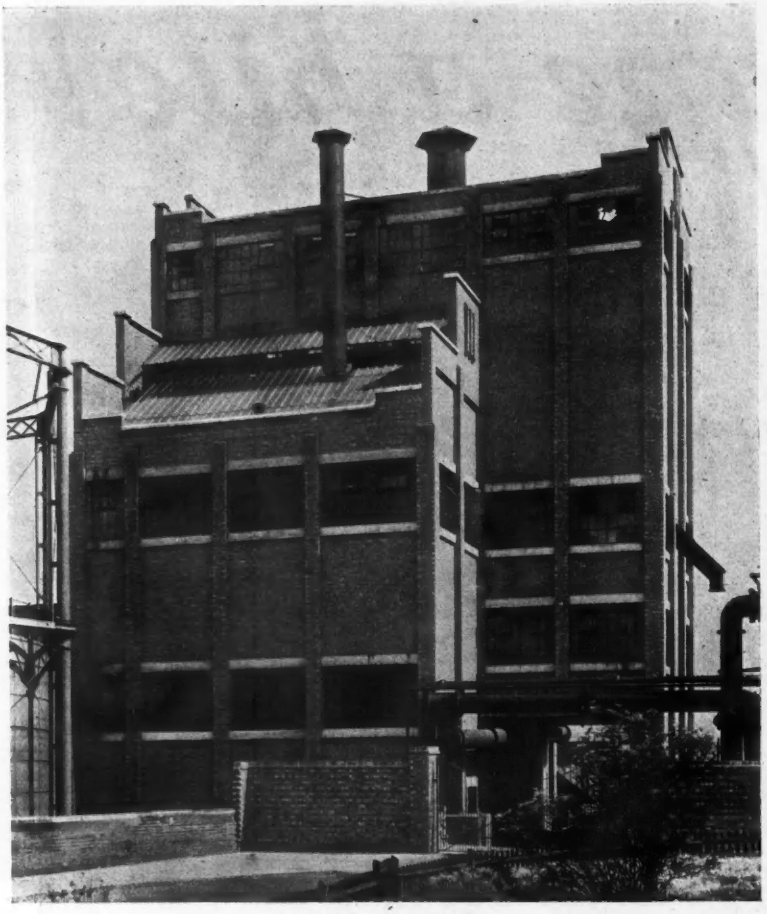

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ARCHITECTURAL FEATURES

From the layman's point of view, perhaps the most interesting feature is the attempt to produce in an essentially industrial building a pleasing architectural appearance. The steel frame-work of the building has been encased in brickwork, and the coal-receiving annexe and coke hoppers are built as integral features of the main building. A liberal use has been made of steel-framed windows for producing maximum natural lighting and ventilation. Parapets with "Snowcrete" coping form a pleasing finish to the skyline. Rain-water pipes are not visible, being taken down internally. The full effect of the building when viewed from Desborough Road is masked to some extent by the abutment of the old horizontal retort house, but when this is dismantled and the new retort house extended it will appear as an independent and symmetrically designed structure.

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condensible oils increasing with the decrease of hydrocarbon decomposition effected.

The Author suggests that if the four conditions of carbonization enumerated above are successfully carried out the results at least should be:

(*a*) A residual fuel which will burn freely in any normal open fire grate.

(*b*) A yield of oils quite beyond anything yet obtained or even anticipated.

These results should be a great inducement to all branches of the carbonization industry to investigate this aspect of carbonization, and it was particularly to focus attention on these secondary destructive reactions and secure for their full investigation a position in the national programme of fuel research that the Author was induced to offer this Paper.

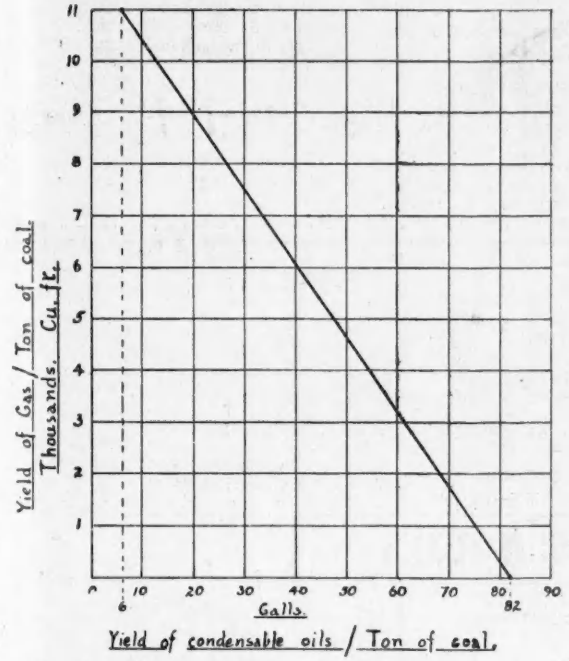

FIG. 13.—*Hypothetical graph showing the possible yields of oil and gas from the carbonization of coal.*

In conclusion, the Author wishes to express his thanks to the Chairman and members of the Gas Committee for freely granting him permission to read the paper, and to Mr. R. Walker, the Chief Engineer, for his interest in furthering the process.

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(1) T. BIDDULPH-SMITH.—"An Examination of the Primary Oils of Carbonization," *C.O.M.A. Year Book*, 1926–7, p. 318.
(2) *Idem.*—"Notes on the Mechanism of the Carbonization Process, with Special References to the Formation and Prevention of Coke Sponge," *ibid.*, 1941, p. 165.
(3) G. E. FOXWELL.—"The Path of Travel of Gases in the Coke Oven," *J.S.C.I.*, Sept. 15, 1921.
(4) *Report of C.O.M.A. Carbonization Research Panel*, Sept., 1943.
(5) E. M. SPIERS.—"Technical Data on Fuels."

The Kennington and Streatham Vale Works of Smith Meters, Ltd., will be closed for the annual holiday from the evening of July 27 to the morning of Aug. 7.

Dusk to Dawn Street Lighting is to be resumed at Plymouth from July 15, but the cost of it will be more than pre-war, and a supplementary estimate of £31,050 is to be submitted to the City Council's Finance Committee.

The Works Holidays of George Wilson Gas Meters, Ltd., have been arranged as follows: Coventry and Blackpool, from July 7–14; London, from July 28–Aug. 4; Manchester, from Aug. 4–11. A small staff will be retained in the cases of Coventry, London and Manchester to deal with any urgent enquiries.

Over 8,000 daily are visiting the Aluminium Exhibition at Selfridges, and to meet popular demand the closing date has been extended to July 14. The Exhibition was planned to demonstrate the versatility of aluminium and its alloys. It was to be an educative rather than a "trade" show. In practice, however, it has proved to be both of these. It is understood that the Exhibition will afterwards tour the Provinces, visiting Leeds, Edinburgh, Glasgow, and Birmingham in turn.

Gas Undertakings' Results

Belfast Gas Department.—Net profit for the year ended March 31 was £60,834, a decrease of £47,458 compared with the previous year. Total gas produced was 5,075 million cu.ft., an increase of 7.6% over 1943–44 and an increase of 897 million cu.ft., or 21.5% compared with the last pre-war year. Gas sold was 4,893 million cu.ft., an increase of 294 million cu.ft. Revenue from ordinary and prepayment consumers, at £1,027,079, was £69,485 higher than in the previous year. Coal carbonized amounted to 215,281 tons, an increase of 10,076 tons over the previous year and the largest quantity ever treated. The increase in the cost of coal alone was equivalent to an increase in manufacturing costs of 5d. per thousand cu.ft.

Buckhaven and Leven.—In his annual report to the Buckhaven and Leven Gas Commissioners, Mr. H. A. Aitken, Engineer and Manager, states that at 260 million cu.ft. the output of gas for the year to May 15 was 16 million cu.ft. more than in the previous year, and 78 million cu.ft. above the total for the last pre-war year, when street lighting was in full operation. Statistics for the year under review compared with those for 1923, the first year under the control of the Gas Commissioners, show that while the tonnage of coal carbonized increased by 67%, the gas made increased by 178%, tar produced by 160%, and coke by 50%. The price of coal has increased by 59%.

Glasgow.—Gross revenue of the Glasgow Gas Department for the year ended May 31 was £2,919,688, and gross expenditure £2,914,766, showing a surplus on the year of £4,922, bringing the accumulated surplus to £44,488. Gas consumption reached a new record figure of 12,124 million cu.ft., compared with 11,391 million cu.ft. for the previous year, an increase of approximately 6.4%. A comparison with the last pre-war year reveals an increase of 22.4%. Revenue has been largely influenced by a sharp increase in domestic consumption. The industrial load fell by 4.4% over the year, while domestic consumption rose by 11.26%.

Leeds.—Presenting the Gas Committee's annual report for the year ended Mar. 31 to the City Council, Councillor H. W. Sellers stated that in spite of revenue contributions to capital of over £32,000, an increase of £70,000 in the cost of coal, and increased cost of wages, the Department finished the year with a surplus of £13,319 on the year's working. Gas sales at 4,103 million cu.ft. set up a new record, the increase over 1934–35 being more than 40%. The increased demand had been met only with the greatest difficulty, chiefly due to shortage of labour and unsatisfactory deliveries of coal. Calorific value had been maintained at 471 B.Th.U., against the prescribed 470 B.Th.U. The amount of coke produced was slightly less, owing to the Government's instructions to manufacture more carburetted water gas. The Department's Home Guard Company was stood down on Nov. 1, when each member was presented with a photograph of the Company's roll of service, the original of which is displayed in the showrooms at Market Hall. In spite of all the increased costs borne by the Department since the outbreak of war, the price of gas has been increased only once, and at present the Gas Committee does not contemplate any further increase.

Nottingham.—A record output of 4,129,543,000 cu.ft. of gas is recorded in the annual report for the year ended Mar. 31. Most of this increased demand is shown to be due to domestic consumers turning to gas because of the difficulties in obtaining coal supplies and the tendency to improve welfare conditions by easing the burden of the housewife. Lack of adequate storage, due to the loss of two holders through enemy action, is restricting the service the Department is able to give south of the Trent, and the report urges that it is imperative to take steps to replace the holders without delay. The gas-making plant at Basford is fully extended, and plans are in preparation for a complete new section with a capacity of 5 million cu.ft. per day. A new 16-in. main from Eastcroft to Carlton, completed last November, has improved the supply position in that area. Other mains developments are designed, and work will proceed as men and materials become available. New purifiers at Basford are under construction and it is hoped they will be ready for use by the winter.

Welcome Home

A welcome back to Civvy Street is being extended by the Gas Light and Coke Company to those men and women employees who are beginning to trickle back from the Forces and other forms of National Service.

The welcome takes the form of a series of Saturday morning At Homes which have been arranged by the Governor, Mr. A. E. Sylvester, and his principal officers. Already Mr. Sylvester has personally greeted 500 employees, and assured them that he is glad to have them back again on the Company's "Active Service" list.

This 500, however, represents only a fraction of the total labour force which will return when the war against Japan is won. Figures show that the Gas Light & Coke Company has maintained its supply of gas over a 500 square miles area with only 64% of its pre-war personnel. The number of men and women with the Forces, on National Service, and seconded to industry reached 8,363 in June, 1944.

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market July 9.

There are no changes to report in the prices of Coal Tar Products.

As from March 5, by the Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), the maximum price of Pitch for briquetting has been increased to 60s. per ton f.o.r. supplying works, and the prices for Road Tar, as fixed by the Coal Tar Products Prices Order, 1943, S. R. & O. No. 1528, have been increased by one half-penny per gallon. There is also an increase of 5s. per ton in the price of standard Creosote/Pitch Mixture.

The only change to report in connexion with the prices of Coal Tar Products is the coming into effect on June 11 of a new Government Order increasing the prices of Coal Tar Spirits. This Order is entitled the Control of Benzole and Coal Spirit Order, 1945 (S. R. & O. 1945, No. 681).

Control of Toluene (No. 4) Order, 1944 (S. R. & O. 1944, No. 170), contains an amendment of the Control of Toluene (No. 3) Order, 1943.

Coal Tar Products Prices (No. 2) Order, 1944 (S. R. & O., 1944, No. 1051), allows increases in the maximum prices for all forms of Naphthalene.

The Provinces July 9.

The average prices of gas-works products during the week were : Pitch and Crude Tar,* Toluole, naked, North, 90's. 2s. 4d. to 2s. 6½d., pure, 3s. 2½d. (now controlled by S. R. & O. 1945, No. 681), operative from June 11, 1945. Benzole and Coal Spirit, also Coal Tar Naphtha and Xylole, are now controlled by the Control of Benzole and Coal Spirit Order, 1945, dated June 1, 1945, S. R. & O. 1945, No. 681, operative from June 11, 1945. Carbolic acid, 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943. Naphthalene now controlled under S. R. & O. 1944, No. 1051, operative from Sept. 22, 1944.

Attention is called to Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), referred to on p. 305, "JOURNAL" of March 7.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland July 7.

Export inquiries are numerous, with prices steady. Refined tar*: Yield to distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5¼d. to 6½d.; hydrogenation oil,* 5¾d.; low gravity or virgin oil,† 7½d. to 7¾d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Influenced by the confident forecasts of the result of the General Election, markets opened with an all-round strengthening of tone. Further gains were recorded in the Funds, and home rails were also marked up. The industrial section had a good week with some interesting features, notably among iron, steel and radio shares.

The Gas Market also shared in the stronger sentiment, although the volume of business is influenced by the amount of stock available. Both Gas Light and Newcastle units closed firmer, and Montevideo stock hardened again with a rise of 5½ points. Half-yearly interim dividend announcements will be appearing shortly, and although doubtless most of these will be at similar rates to those for the corresponding half-year of 1944, it will be interesting to see if any increased rates are recommended.

The following were the price changes last week :

PROVINCIAL EXCHANGE

Newcastle Units	26/6—27/–	+–/3d.

OFFICIAL LIST

Alliance & Dublin	113—118	–1
Bournemouth max. div.	162—167	+2
Commercial 5 p.c. Deb.	115—120	+3
Gas Light Units	22/3—23/3	+–/3d.
Ditto 4 p.c. Pref.	102½—105½	+½
Ditto 3 p.c. Deb.	88½—91½	+½
Ditto 5 p.c. Red. Deb.	107—110	+1
Ditto 4½ p.c. Red. Deb.	107—110	+1
Montevideo Ord.	95—99	+5½
Primitiva Holdings Ord.	12/—13/–	+–/3d.
Severn Valley Ord. (x.d.)	23/6—24/6	July 2
South Metropolitan 3 p.c. Deb. (x.d.)	87—90	,,

SUPPLEMENTARY LIST

Tottenham 5 p.c. Reg. Red. Mortgs. (x.d.)	99—102	July 2

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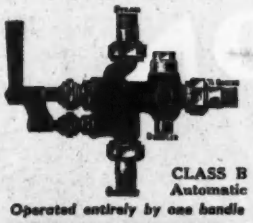
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He cried "What a notion—
Leaky pipe in the ocean!
Thank goodness I've brought my FLUXITE."
For all SOLDERING work—you need FLUXITE—the paste flux—with which even dirty metals are soldered and "tinned." It does not "poison" the solder nor corrode the metal—and can be used with safety even on sensitive apparatus.
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Write for Leaflets on CASE HARDENING STEEL and TEMPERING TOOLS with FLUXITE also on "WIPED JOINTS." Price 1d. each.
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ENGINEER and Manager (44) desires change, thoroughly experienced in Manufacture and Distribution in Works up to 50 million (Vertical or Horizontal). Excellent references.
Address, No. 9449, "GAS JOURNAL," 51, High Street, Esher, Surrey.

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None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

WANTED.—Experienced GASFITTER, who should have a knowledge of fixing Water Heating apparatus. A knowledge of fixing gas-fired Central Heating installations is also desirable.
Standard rate of wages 1s. 9½d. per hour for 47 hours per week, plus out allowance of 10s. 6d. per week.
The position is permanent for a suitable man.
Apply in writing to The Engineer and Manager, The Conway Gas Company, Ltd., Castle Street, Conway.
June 25, 1945.

TWO qualified GASFITTERS required by Gas Undertaking in North Wales, must be experienced in installation and maintenance of gas water heaters.
Rate of pay 1s. 10.9575d. per hour for 47 hour week. State position under the Essential Works Order. Apply to No. 9444, "GAS JOURNAL," 51, High Street, Esher, Surrey.

IMPORTANT FIRM of Tar Distillers require GENERAL WORKS MANAGER with full knowledge of tar distillation and refining of tar products, organizing ability and progressive outlook. State, in confidence, Age, Experience, and Salary required to No. 9448, "GAS JOURNAL," 51, High Street, Esher, Surrey.

BOROUGH OF BATLEY
(GAS DEPARTMENT)
ASSISTANT ENGINEER AND MANAGER

APPLICATIONS are invited for the Position of ASSISTANT ENGINEER AND MANAGER at the Batley Gas-Works.
Applicants must be fully qualified and have a thorough training with practical experience of Gas Manufacture and Works Management.
The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.
Applications, stating Age, Qualifications, Experience and Salary Required, and accompanied by *copies* of three recent Testimonials, must be delivered to the undersigned not later than July 14, 1945.
Town Hall, Batley, Yorks. T. E. CRAIK, Town Clerk.

BOROUGH OF NELSON
(GAS DEPARTMENT)
DISTRICT GAS INSPECTOR

APPLICATIONS are invited for the Position of DISTRICT GAS INSPECTOR at a salary of £284 16s. (inclusive of bonus).
Applicants must be fully conversant and have sound practical knowledge of all modern cooking, water heating and industrial apparatus and be able to supervise the installation of appliances. Applicants must also possess the necessary Certificates in Gas Fitting and Supply.
The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937, and the successful applicant will be required to pass a medical examination.
Applications, endorsed "Gas Inspector," stating Age, Qualifications and Experience, accompanied by *copies* of not more than three Testimonials, must be received by the undersigned not later than the first post on July 18, 1945.
Town Hall, Nelson. F. W. ROBERTS, Town Clerk.
July 3, 1945.

WANTED.—Manager for Gas-Works in North Midlands, disposing of approximately three-quarters of a million cubic feet per day. Applications, stating Salary required, to No. 9450, "GAS JOURNAL," 51, High Street, Esher, Surrey.

BURGH OF ELGIN
(GAS DEPARTMENT)
ASSISTANT ENGINEER AND MANAGER

APPLICATIONS are invited from suitably qualified persons for ASSISTANT ENGINEER AND MANAGER to the Gas Department of the Burgh of Elgin.
The appointment, which will be terminable by one month's notice on either side, will be subject to the provisions of the Local Government Superannuation (Scotland) Act, 1937, and the selected person will be required to pass a medical examination.
Applicants must possess the Higher Grade Certificate of The Institution of Gas Engineers in Gas Engineering (Manufacture) or equivalent, and have had considerable experience in the Technical Control of a modern manufacturing station, with particular reference to W.D. Vertical Retorts. Qualifications and Experience on the Distribution side will be an added advantage.
The commencing Salary will be £350, rising to £400 per annum by annual increments of £25 plus J.I.C. War Bonus, at present amounting to £60 per annum.
Applications, stating Age, Qualifications, Training and Experience, accompanied by not more than three recent Testimonials, should be sent to the undersigned endorsed "Assistant Engineer and Manager," so as to be received not later than July 27, 1945.
Candidates should state their position under the Essential Works Order, and should indicate how soon they anticipate they could secure their release to take up the new appointment.
Canvassing will disqualify, and candidates, when making application, must disclose in writing whether, to their knowledge, they are related to any Member of the Council or any co-opted Member of a Committee, or any official of the Council.
City Chambers, Elgin. JAS. R. BROWN, Town Clerk.
July 4, 1945.

GUERNSEY GAS LIGHT COMPANY LIMITED

APPLICATIONS are invited for the appointment of ASSISTANT MANAGER to the above Undertaking, at a commencing Salary of £400 rising, according to ability, to £500 per annum.
Applicants must have had experience in a Gas-Works of approximately similar size, and be familiar with Horizontal Retort practice, mechanical stoking and handling plant, and either C.W.G. or B.W.G. Plants, and be capable of acting as Deputy to the undersigned during his absence.
Applicants must be Associate Members of the Institution of Gas Engineers, or be prepared to qualify as such.
Applications, stating Age, Experience and Qualifications, together with *copies* only of three recent Testimonials, should reach the undersigned not later than July 20, 1945.
16, Smith Street, Guernsey. R. G. LUXON, Engineer, Manager and Secretary.
July 2, 1945.

The Ministry of Labour and National Service have given permission under the Control of Engagement Order, 1945, for the advertisement of this vacancy.

THE LIVERPOOL GAS COMPANY
MAINS SUPERVISOR

APPLICATIONS are invited for a Position of DISTRICT MAINS SUPERVISOR in the Distributing Department of The Liverpool Gas Company. Applicants should not be more than 45 years of age and should have a sound technical and practical training on all aspects of gas distributing problems, with particular reference to mains, services, low and high pressure gas, district governor operation and maintenance.
Application forms may be obtained by writing to the Personnel Superintendent, Radiant House, Bold Street, Liverpool, 1, and should be returned to him on or before July 31, 1945.
The Salary would be £400 per annum inclusive of the current cost of living bonus, and the successful applicant would be required to pass the usual pre-employment medical examination, and would be admissible to the Officials' Superannuation Fund.

SALES MANAGER

AN important Manufacturer of Gas Appliances has a vacancy for SALES MANAGER. Applicants must have previous experience of sales administration and preferably should have experience of Gas Industry, although lack of latter would not necessarily debar. Salary offered will depend on qualifications of applicant. Late applications from Armed Forces will be considered. Appointment is only open to men with established commercial experience. All applications treated in strictest confidence. Write Box 805, 191, Gresham House, London, E.C. 2.

FULLY qualified SENIOR DRAUGHTSMEN required for the designing and detailing of Gas Carbonizing Plant, Coal and Coke Handling Plants, and General Structural Work.
Replies, stating Experience, Age, and Salary required, to be sent direct to Messrs. Drakes Limited, Constructional Gas Engineers, Ovenden, Halifax.

BOROUGH OF BEVERLEY
(GAS DEPARTMENT)
ASSISTANT GAS ENGINEER AND MANAGER

APPLICATIONS are invited for the Position of ASSISTANT GAS ENGINEER AND MANAGER at a Salary of £350 per annum plus bonus.
Applications, stating Age, Educational and Professional qualifications, and details of Experience, with particular reference to Chemical Control of Works, Drawing Office and Distribution experience, accompanied by *copies* of three recent Testimonials, should be delivered to the undersigned not later than Monday, July 30, 1945, endorsed "Assistant Gas Engineer."
Applicants are required to state their position under the Essential Works and National Service Regulations, and a Medical Examination will be required, under the Superannuation Rules.
Municipal Offices, Lairgate, Beverley. ROBERT PRESTON, Town Clerk.

CONTRACTS OPEN

BRIGG URBAN DISTRICT COUNCIL
(GAS DEPARTMENT)

TENDERS are invited for the following:
(*a*) CAST-IRON MAINS: 187 yards, 12 in.; 407 yards, 10 in.; 977 yards, 8 in.; and sundry specials.
(*b*) MAINLAYING: The laying of the above-mentioned mains.
(*c*) GOVERNOR: The supply and erection of a 12 in. Governor, including the necessary valves.
Further particulars of the Mains and Governor can be had from Mr. C. E. Smith, Engineer and Manager, Gas-Works, Brigg. Plans and Specifications for the main-laying can also be had from the Gas Manager on receipt of £1 1s., which will be returned on receipt of a *bona-fide* Tender. Tenderers may tender for all or any part of the above. Tenders in plain sealed envelopes endorsed "Tender" to be delivered to the undersigned on or before July 16, 1945.
Council Offices, Brigg, Lincs. JOSEPH J. MAGRATH, Clerk of the Council.

THE HONITON GAS & COKE COMPANY, LTD.

TENDERS are invited for excavating and laying approximately 400 yards of 8 in. Cast Iron Gas Mains and Specials and 600 yards of 6 in. ditto. Particulars can be obtained from the undersigned. Tenders to be delivered by July 25. The lowest or any Tender will not necessarily be accepted.
(Signed) F. J. WORTHINGTON, Manager and Director.

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HARRY H. GARDAM & CO., LTD., STAINES.

WANTED.—New or second-hand Vertical steam driven GAS COMPRESSOR set, 50,000 cubic feet of gas per hour at 5-10 lb. per square inch, steam pressure 60 lb.
Address, J. C. Cotterill, Manager, The Gas-Works, St. Austell.

FOR SALE.—About 70 new Fireclay "D" Retorts, 22 in. by 16 in. by 21 ft. long, in three sections. Not now required owing to dismantling. Reply, No. 9446, "GAS JOURNAL," 51, High Street, Esher, Surrey.

FOR SALE. — One Mild Steel Labyrinth for Woodall Duckham T.I.C. Tar Plant, capacity 20 tons Crude Tar per day. Condition as new. Price £8 f.o.r. Cambridge.
Applications to J. Hunter Rioch, Managing Director and Secretary, The Cambridge University and Town Gas Light Company, 52, Sidney Street, Cambridge.

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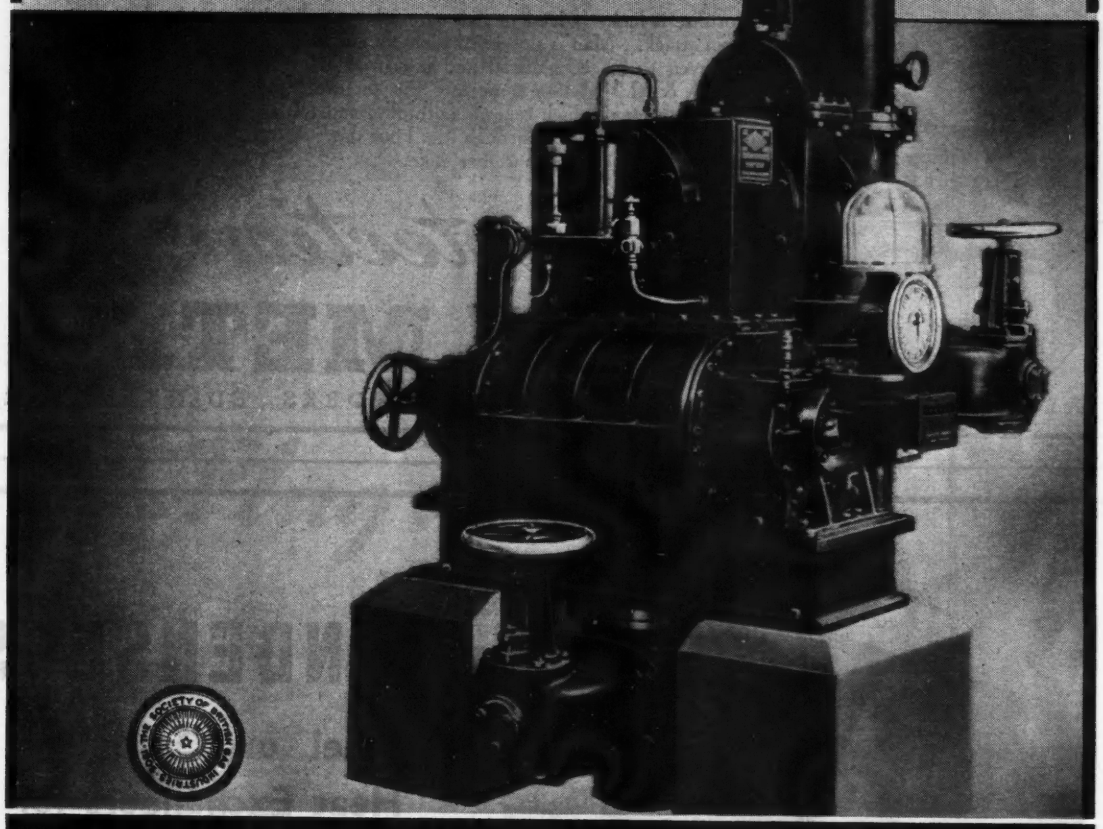

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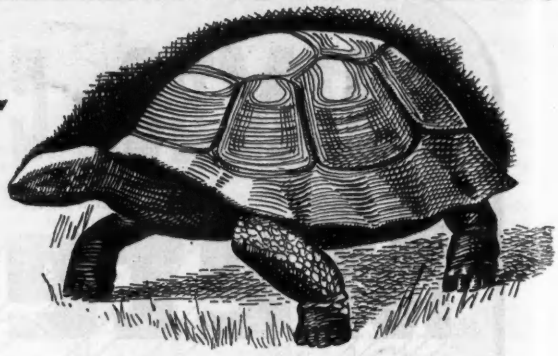

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The tortoise is lucky indeed in that nature has provided him with adequate protection from attack. Man is not so fortunately endowed, and his need for protection extends even to his commercial and industrial life. In the Gas Industry that is where "A & M" Meters come into the picture. The "A & M" Meter is a precision instrument which records faithfully, and for an indefinite period of time, the volume of gas passing through it. Thus the "A & M" Meter affords valuable protection to supplier and consumer alike.

your *protection* is the

"A&M" METER

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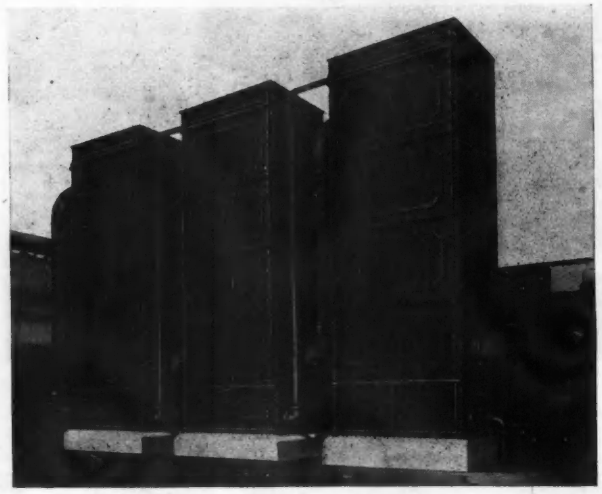

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LONDON OFFICE - Temporary Address:

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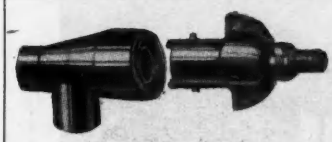
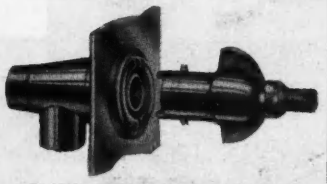


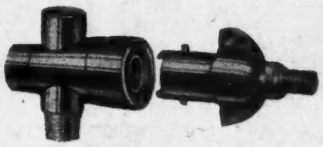
"ORDINARY" TYPE
No. 1, Mk. II.
Socket screwed ½ in. B.S.P. Nose piece of plug screwed ½ in. B.S.P.

"PEDESTAL" TYPE
No. 2, Mk. II.
With Flange for floor fixing. Socket screwed ½ in. B.S.P. Nose piece of plug screwed ½ in. B.S.P.

"PEDESTAL" TYPE
No. 3, Mk. II, with stem cock.
This only differs from No. 2 in that the stem cock is added.



"FLUSH FITTING" or "SKIRTING BOARD" TYPE
No. 4, Mk. II.
This type has heavy brass plate 4 in. long and 3 in. wide, with holes in corners for fixing screws. Socket screwed ½ in. B.S.P. Nose piece of plug screwed ½ in. B.S.P.



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Any other Portable Gas Appliance

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Merely by inserting the plug into the socket and giving it a quarter-turn, the appliance (whether it be gas fire, poker, iron or copper) is connected and the gas automatically turned on.

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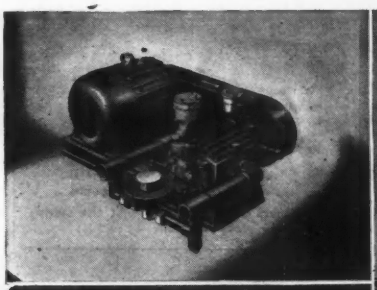

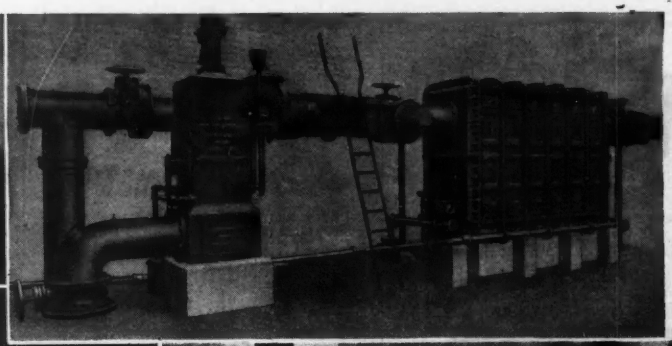

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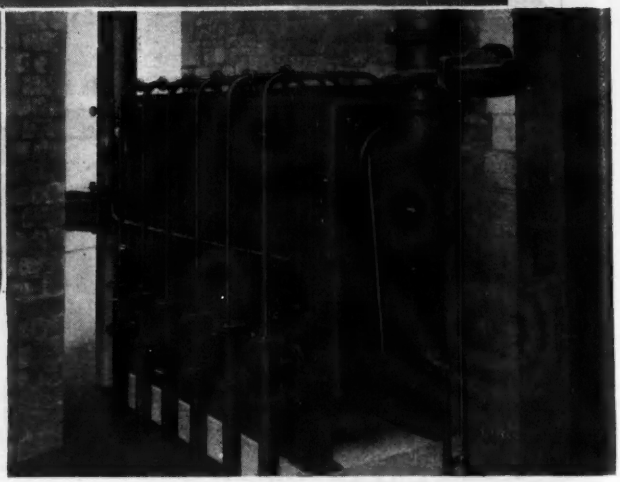
PROVISIONALLY PATENTED

New Simplified Circulating System



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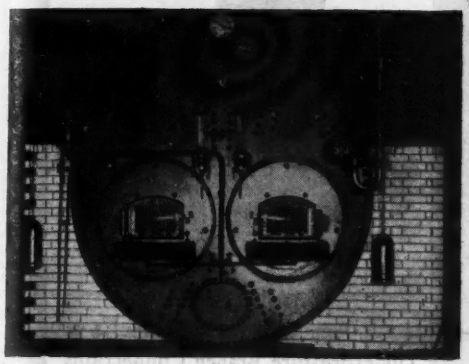

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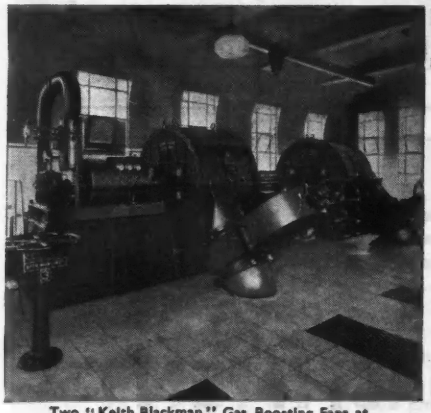
"Keith" Centrifugal Fan providing induced draught to boiler fires.



Two "Keith Blackman" Gas Boosting Fans at large Gas Works.

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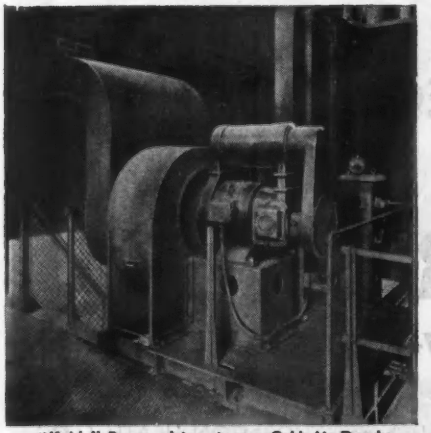
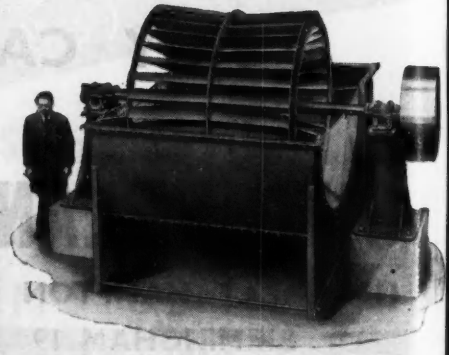


"Keith" Fan supplying air to a Cold Air Douche Plant at a Gas Works.

KEITH BLACKMAN FANS



Large belt-driven double-inlet "Keith" Fan with top casing removed.

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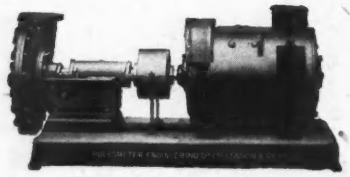

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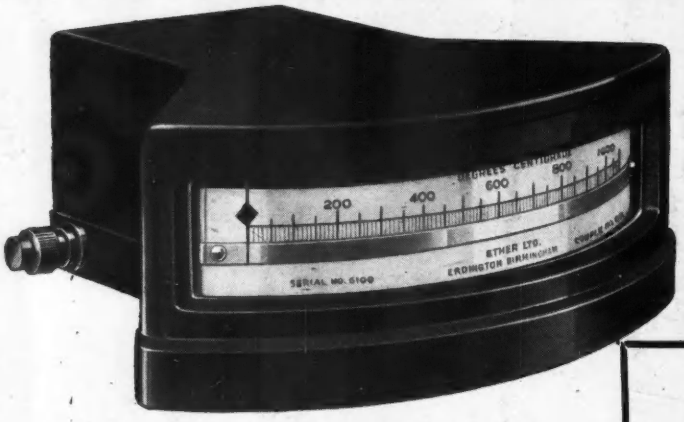

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